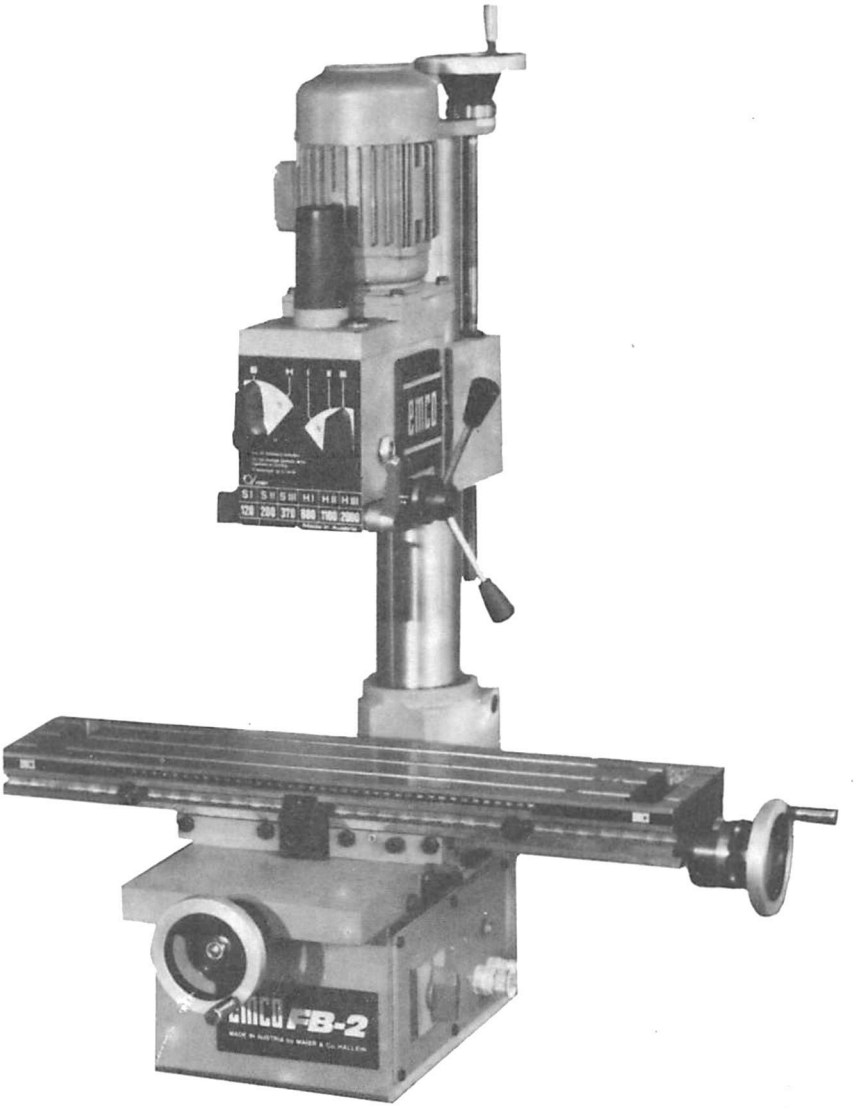
Instruction book



emco FB-2

Coordinate Milling and Drilling Machine

Englisch Order No. EN2 455

Auflage: 10. 9. 8. 7. 6. 5. 4. 3.

92 91 90 89 88 87 86 85

Maier + Co.

A-5400 Hallein/Austria

SAFETY RULES FOR POWER TOOLS

1. KNOW YOUR POWER TOOL
Read the owner's manual carefully. Learn its application and limitations as well as the specific potential hazards peculiar to this tool.

2. GROUND ALL TOOLS
If tool is equipped with three-prong plug, it should be plugged into a three-hole receptacle. If adapter is used to accommodate two-prong receptacle, the adapter wire must be attached to a known ground. Never remove third prong.

3. KEEP GUARDS IN PLACE
and in working order.

4. REMOVE ADJUSTING KEYS AND WRENCHES
Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning on tool.

5. KEEP WORK AREA CLEAN
Cluttered areas and benches invite accidents.

6. AVOID DANGEROUS ENVIRONMENT
Don't use power tools in damp or wet locations. Keep work area well illuminated.

7. KEEP CHILDREN AWAY
All visitors should be kept a safe distance from work area.

8. MAKE WORKSHOP KID PROOF
— with padlocks, master switches, or by removing starter keys.

9. DON'T FORCE TOOL
It will do the job better and be safer at the rate for which it was designed.

10. USE RIGHT TOOL
Don't force tool or attachment to do a job it was not designed for.

11. WEAR PROPER APPAREL
No loose clothing or jewelry to get caught in moving parts.

12. USE SAFETY GLASSES
Also use face or dust mask if cutting operation is dusty.

13. SECURE WORK
Use clamps or a vise to hold work when practical. It's safer than using your hand, frees both hands to operate tool.

14. DON'T OVERREACH
Keep your proper footing and balance at all times.

15. MAINTAIN TOOLS IN TOP CONDITION
Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

16. DISCONNECT TOOLS
before servicing and when changing accessories such as blades, bits, cutters.

17. AVOID ACCIDENTAL STARTING
Make sure switch is "OFF" before plugging in cord.

18. USE RECOMMENDED ACCESSORIES
Consult the owner's manual. Use of improper accessories may be hazardous.

The operation of any power tool can result in foreign objects being thrown into the eyes, which can result in severe eye damage. Always wear safety glasses or eye shields before commencing power tool operation. We recommend **Wide Vision Safety Mask** for use over spectacles, or standard safety glasses . . . available at Sears retail or catalog stores.

Important Tips

+ Read all instructions - a few minutes now may save hours later.

+ Follow safety rules for power tools.

+ Check bags and cartons for parts.

+ Keep the lathe clean, lubricated, and adjusted as instructed.

+ Do not leave cleaning rags, tools or other materials on lathe bed or around moving parts of the lathe.

+ Work only with sharpened tools.

+ Check oil level regularly.

+ After working with coolant, clean wet surfaces thoroughly and oil these surfaces.

+ Clamp all workpieces and tools firmly.

+ To prevent unnecessary wear of the slides and to assure optimum working results, all movements other than the feed must be blocked.
  Example: If cross slide feed for milling is used, then longitudinal slide, pinion and vertical slide must be clamped.

+ Switch spindle speeds only when machine is OFF.

+ Never clean machine with compressed air.

Technical Data

Longitudinal travel	15"	(38o mm)
Cross travel	5.5"	(14o mm)
Table size	25" x 6"	(63o x 15o mm)
Maximum height between milling table and spindle nose	14.5"	(37o mm)
Milling head	6 spindle speeds (12o,2oo,37o,68o, 11oo,2ooo rpm)	
Spindle taper	MT2	
Quill stroke	1.6"	(4o mm)

Milling head can be turned and swivelled 36o°.

Weight (with machine stand) 6o lbs.(approx.13o kg)

Electrical Equipment:

IEC-standardized motor, dust- and splashproof according to IP-54.

Voltage, Frequency	according to requirements of country delivered to
Motor capacity, single-phase	o.18 kW (o.25 HP)
Motor capacity, three-phase	o.25 kW (o.34 HP)

Electrical equipment optional as:

1. Standard outfit: ON- and OFF-switch, dust- and splashproof according to IP-54, cable

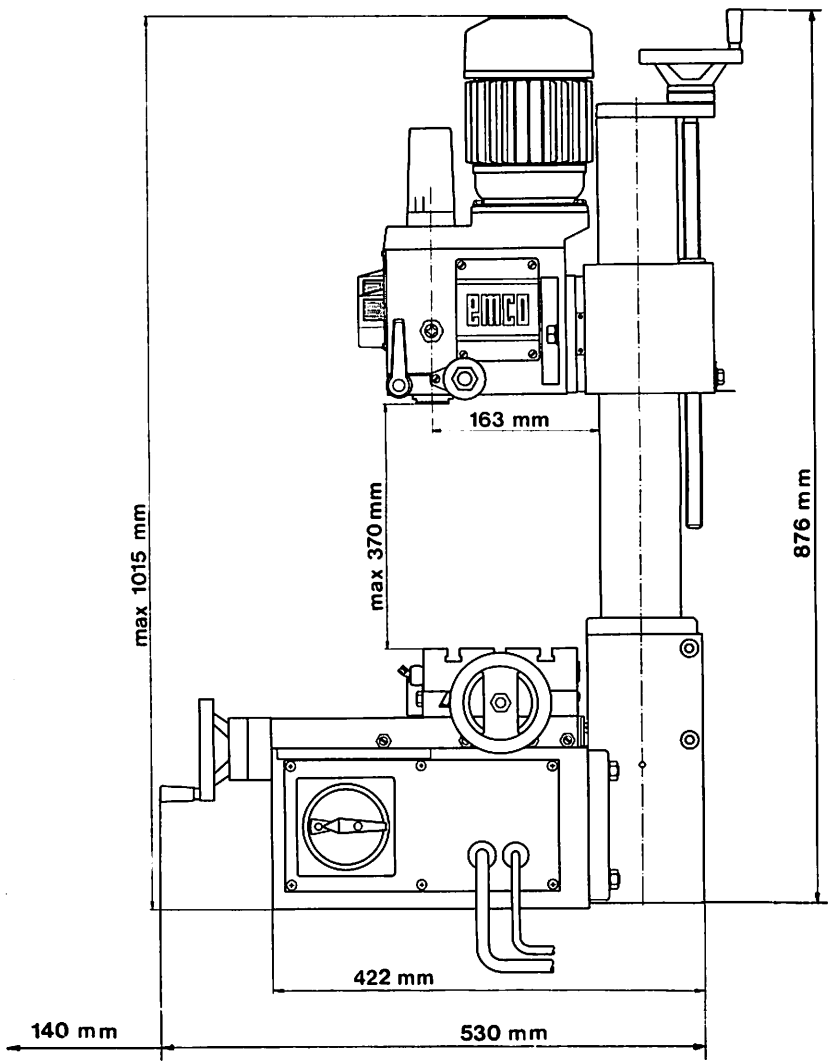
   or

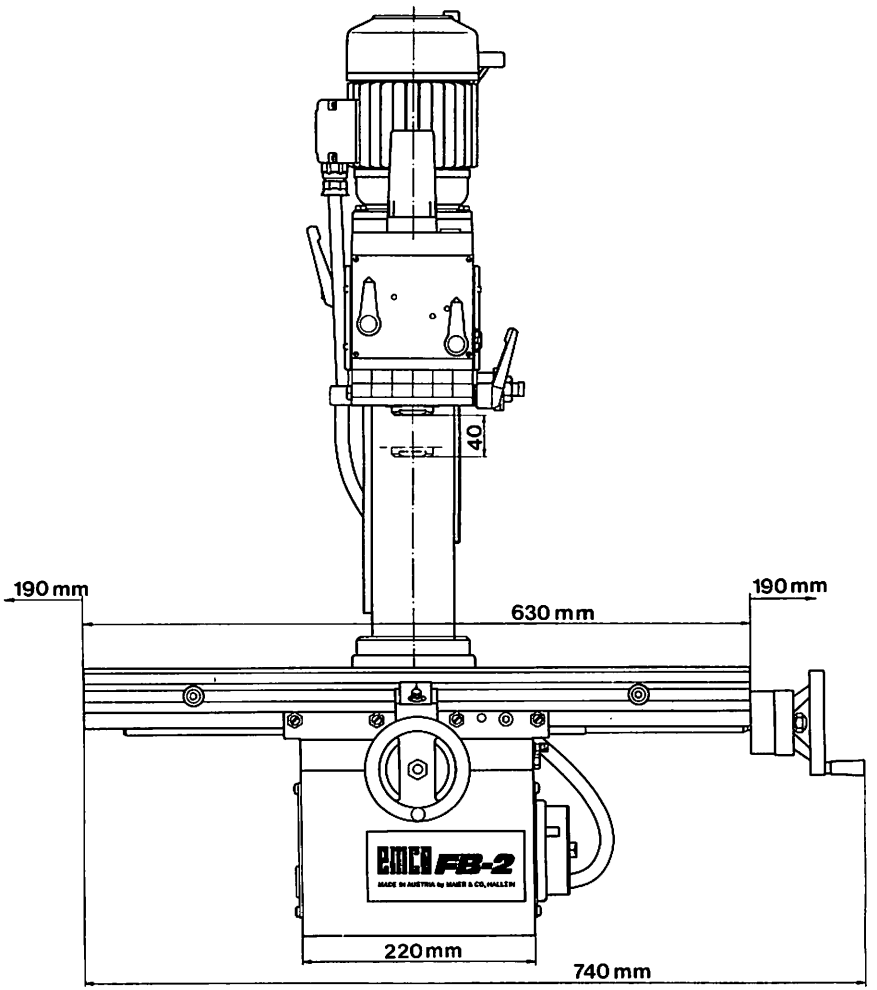
2. Safety outfit according to VDE o113 consisting of: lockable safety switch with Main- and Emergency-OFF function as well as low-voltage release; IEC-Standardized motor, dust- and splashproof according to IP-54, cable (only for 22oV/5o cycles or 38oV/6o cycles).

BASIC MACHINE CONSISTS OF:

Milling and drilling head, column, coordinate table with longitudinal stops, motor, set of service tools, grease gun, 2 bottles of gear oil for vertical head, instruction manual, service parts list.

Dimensions


163 mm
max 370 mm
max 1015 mm
876 mm
422 mm
140 mm
530 mm


40
190 mm
630 mm
190 mm
emco FB-2
220 mm
740 mm

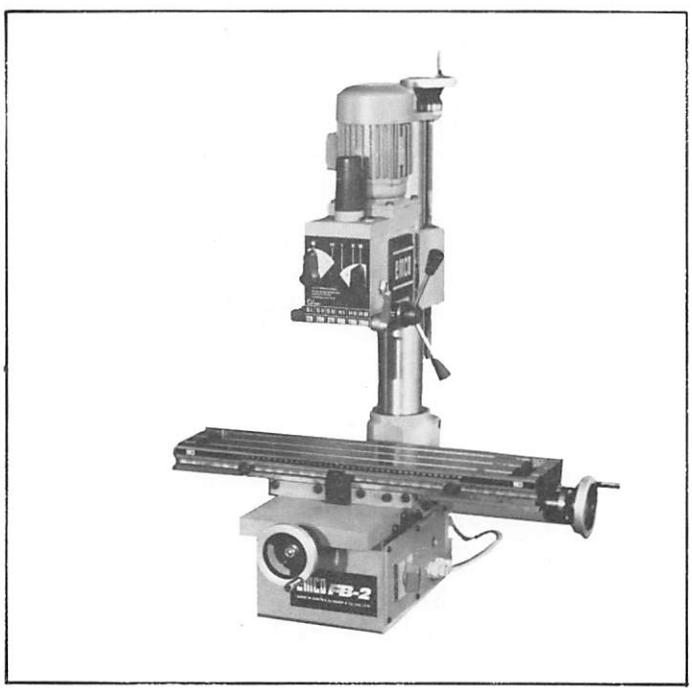
UNPACKING THE MACHINE

The machine is delivered in a wooden crate. It is fixed from the underside of the crate with 4 hexagon screws (M1ox2o).

Setting-Up the Machine

The EMCO FB-2 Coordinate Milling and Drilling Machine has 3 set-up possibilities:

1. Mounting the machine to an existing worktable
2. Mounting the machine and accessory chip tray to an existing worktable
3. Mounting the machine and accessory chip tray to accessory machine stand with tool cabinet.



1. SETTING-UP THE MACHINE ON AN EXISTING WORKTABLE

The existing worktable must be robust, the thickness of the table top should be at least 1.5" (4o mm).
Four threaded holes (M1o, depth o.8" or 2omm) are machined in the bottom of the machine base.
The length of the screws for securing the machine to the table top depends on the thickness of the table top.
Length of screws: thickness of table top + o.5" (15mm).
For boring the holes in the table top, see diagram below.
It is recommended that an oil resistant rubber padding be placed between machine and table to eliminate vibrations.
Ideal height of worktable: 3o" (78omm)

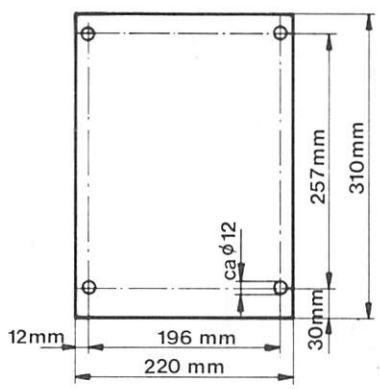


Diagram for boring holes in table top

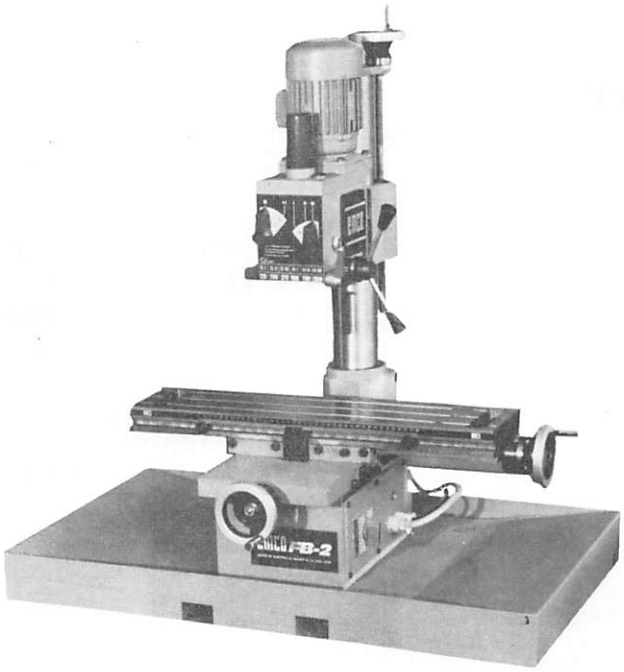
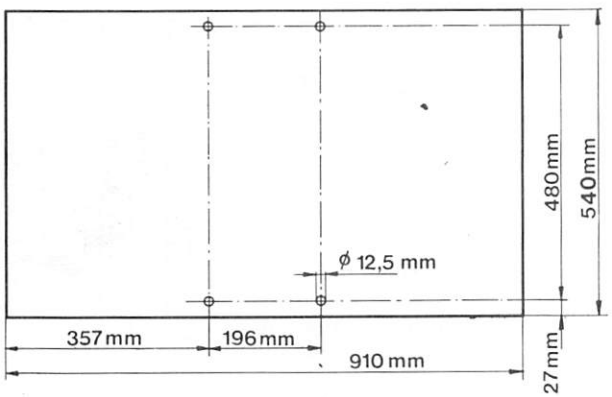
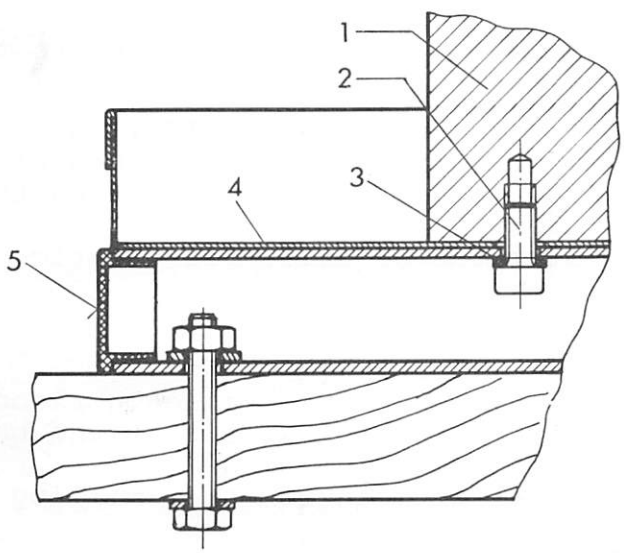


Diagram for boring holes in table top for chip tray



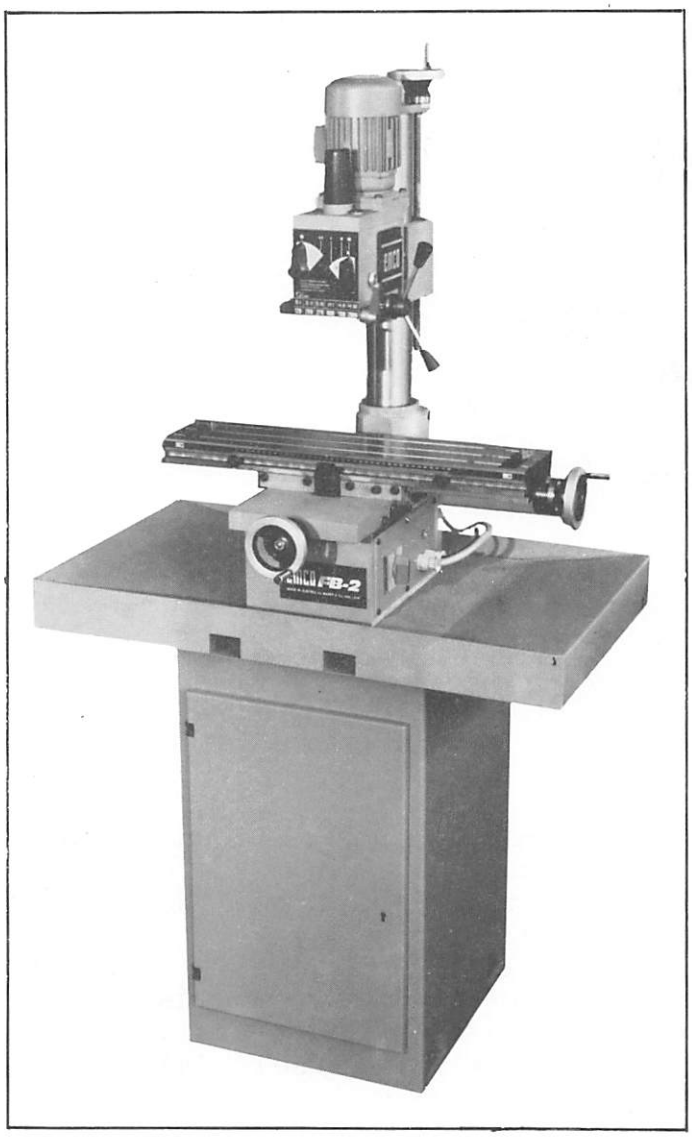


2. MOUNTING THE MACHINE ON THE CHIP TRAY, MOUNTING THE CHIP TRAY

The machine (1) is mounted on the chip tray from the bottom with the 4 allen head screws (2) (M1ox2o DIN 912).
The plastic washers (3) serve to secure the screws against loosening and as a sealing.
The chip tray itself (4) is then fixly mounted to the worktable.
Recommended length of screws: thickness of table top + about o.5" (15mm).
Recommended thickness of screws: 3/8".

Connecting Coolant Attachment: see page ...

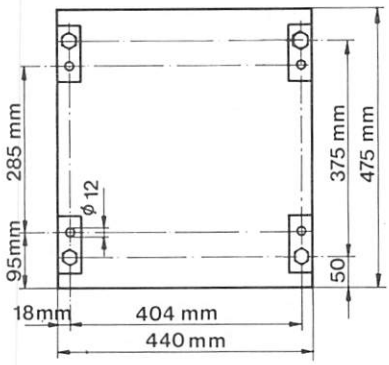
When the chip tray is mounted, cover opening of chip tray with plugs (5).

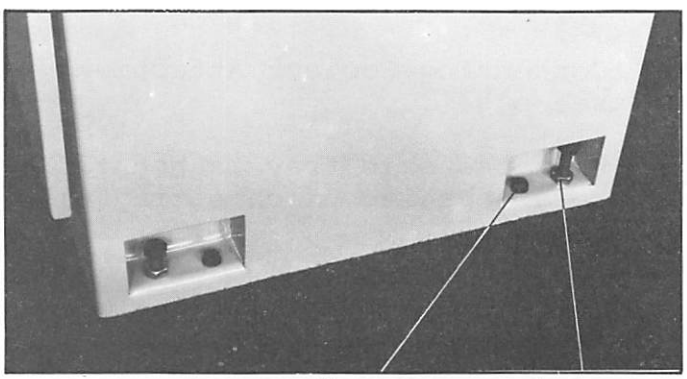


3. MOUNTING THE MACHINE ON THE CHIP TRAY AND MACHINE STAND

The chip tray is fixly mounted on the machine stand with the 4 allen head screws (M1ox2o DIN 912), plastic washers and hexagon nuts. The machine itself is then fixed from the bottom with the 4 allen head screws and plastic washers as shown on page 5.

Diagram for mounting the machine stand to the floor



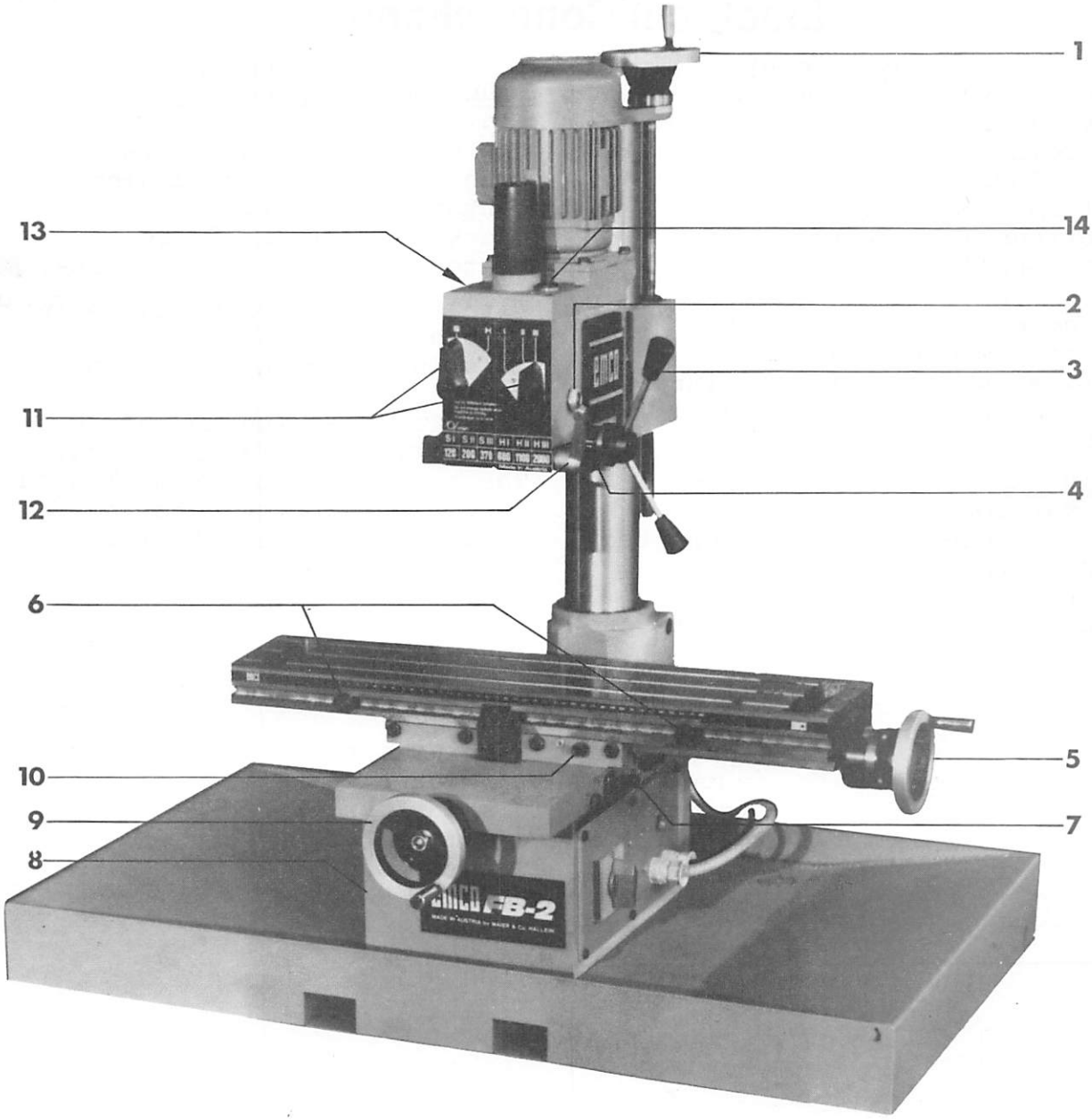


Mounting the machine stand to the floor:

4 wood screws 8x7o DIN571 and 4 plastic dowels are packed with the machine stand for fixing to floor.
Diameter of drill for plastic dowels: 3/8" (1omm)

Levelling the machine:

The machine is levelled horizontally with the 4 set screws at the base of the machine stand.
Level of measurement = milling table



Controls

1 Handwheel for vertical slide

2 Oil level gauge

3 Lever for lowering quill

4 Adjustable depth stop for quill

5 Handwheel for longitudinal feed

6 Adjustable stops for longitudinal movement

7 Clamping screw for cross slide

8 Machine base with electrical housing and main switch

9 Handwheel for cross feed

1o Clamping screw for longitudinal slide (milling table)

11 Switch for spindle speeds

12 Clamping lever for quill

13 Clamping lever for vertical slide

14 Oil fill plug

Electrical Connections

Due to the various types of electrical receptacles, the motor cord is not equipped with a plug.
ATTENTION: The electrical connections must be made professionally. Cord must be connected to a grounded receptacle. Only then is the operator protected from an electrical shock when a failure occurs in the motor or electrical equipment.

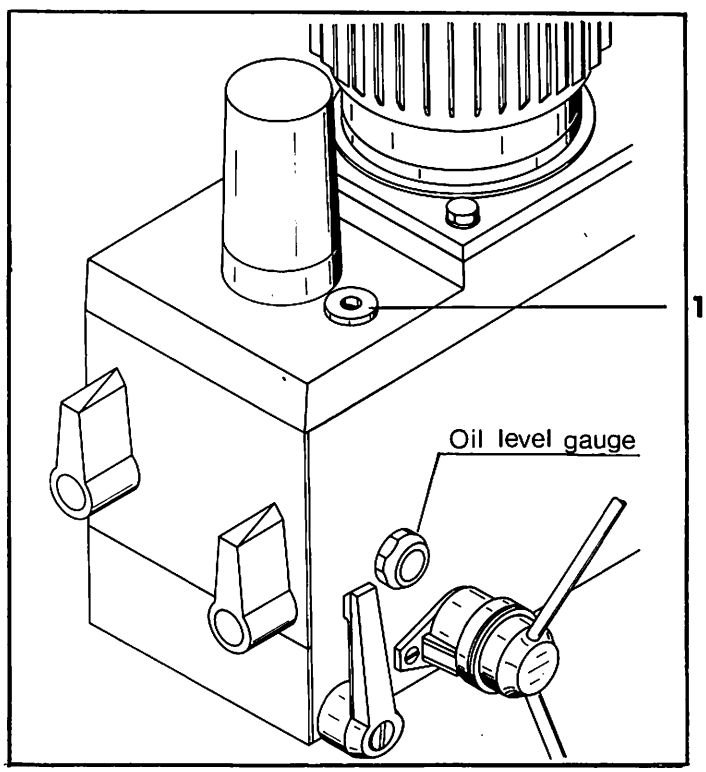
Mounting the plug for single-phase version:
the yellow-green wire is connected to the grounding contact. The blue and brown wires (MP,R) are connected to the other contacts.

Mounting the plug with three-phase equipment:
The yellow-green wire is connected to the grounding contact. The blue, brown and black wires (R,S,T) are connected to the other contacts.

With the three-phase equipment, it can happen that the motor runs in the wrong direction. In this case, 2 wires (for example, the blue and black wires) must be interchanged. The arrow on the vertical head shows the correct rotating direction of the spindle.

CLEANING THE MACHINE

All unpainted machine surfaces are coated with a rust protective. This rust protective must be removed and after this, all these unpainted machine surfaces must be lightly coated with oil.



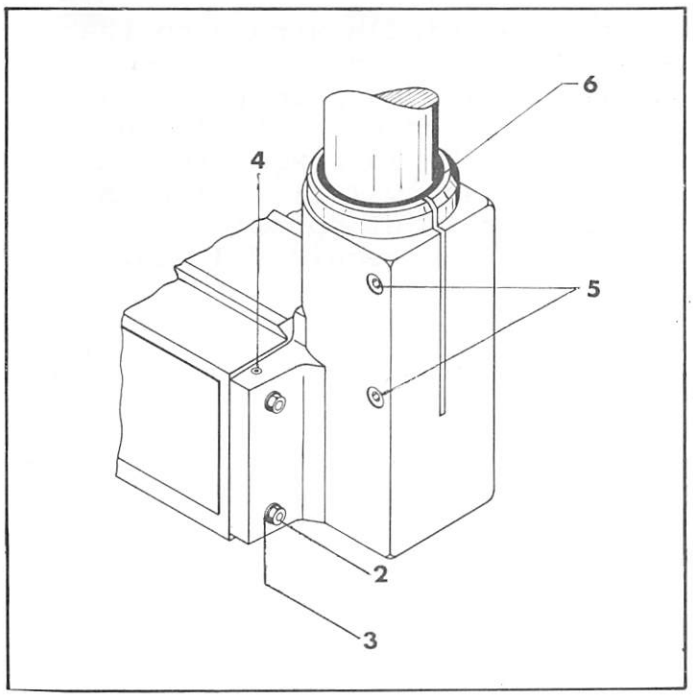
FILLING IN THE GEARBOX OIL

Quantity of oil: o.5 l (2 bottles)
Oil quality: EMCO Special Oil
Ref.no.751 ooo
or Recommended Oils
on page 13

The gearbox oil is supplied with the machine. After unscrewing the oil fill plug (1), o.5 l gearbox oil is poured in. The correct oil level is in the middle of the oil level gauge, when vertical head is standing in upright position.

Oil change: after approx. 3oo hours of operation. The vertical head is swivelled horizontally and the oil level gauge unscrewed.

Operating Tips – Adjustments

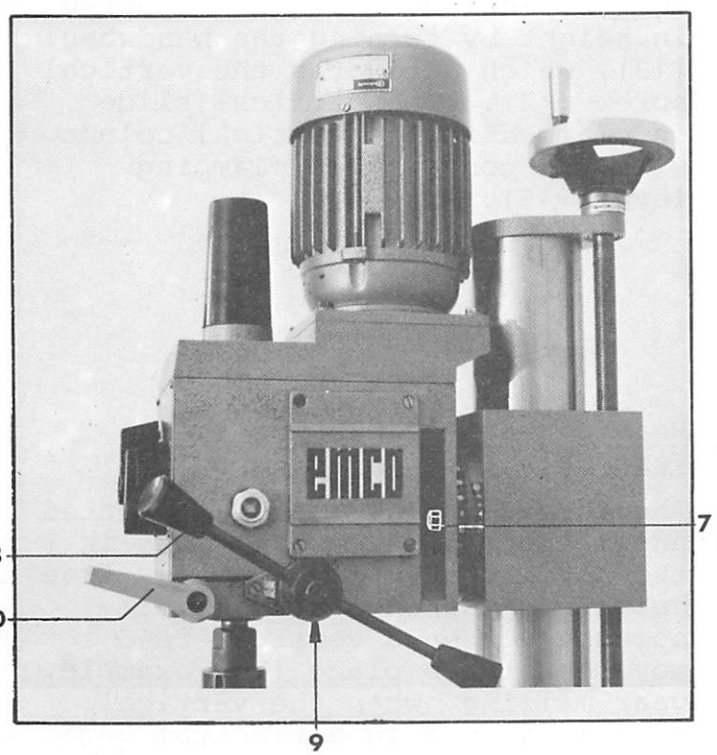


The Column Support:

The column support is permanently attached to the base with 4 hexagon nuts (2) and washers (3). It is set at an exact right angle to the milling table by means of 2 setting screws (4).

Turning the Vertical Unit:

After loosening both allen head screws (5), the vertical column and with it the whole unit can be turned. The graduated scale (6) and a setting mark on the column enable accurate positioning.

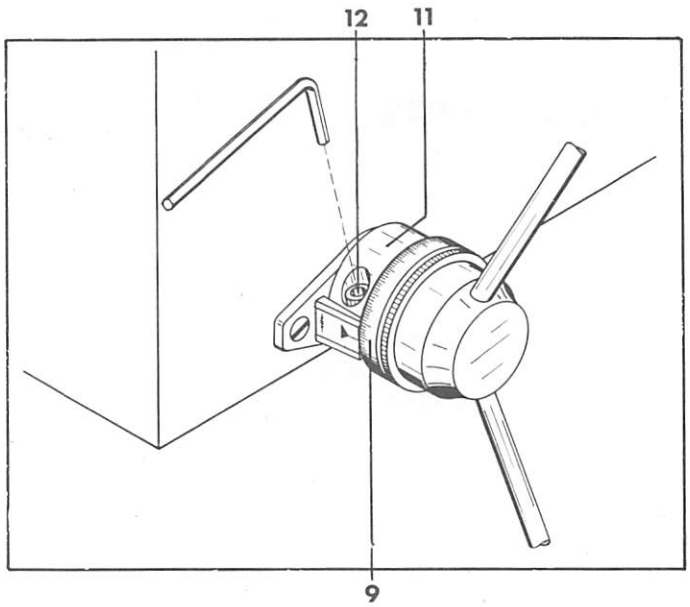


Swivelling the Vertical Head:

After loosening the two hexagon nuts (7), the vertical head can be swivelled by 360°.
Degree of accuracy 10 degree minutes can be attained with aid of the graduated scale and vernier.

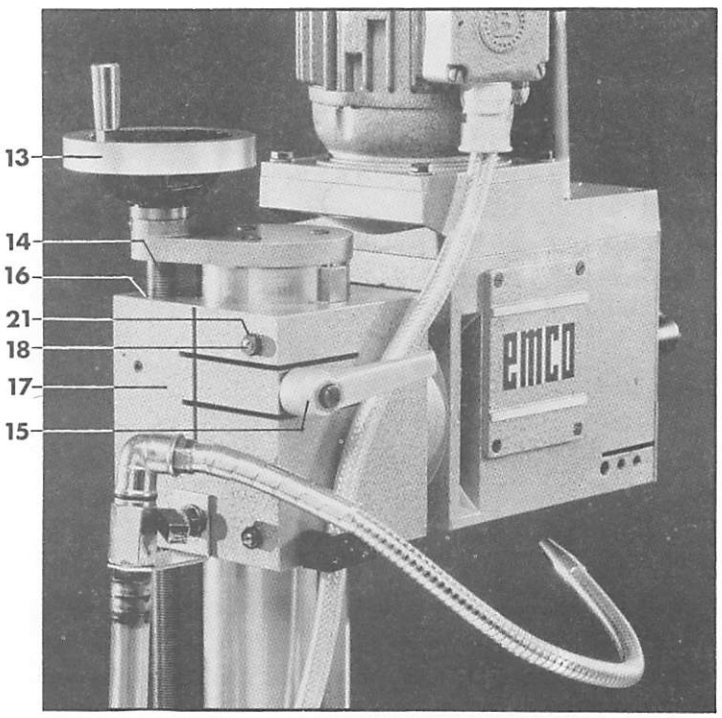
Stroke of spindle: 1.60" maximum (40mm)
By swivelling the toggle (8) counterclockwise the spindle is lowered.
The distance of downward spindle motion can be accurately seen on the graduated scale (9).

Clamping the spindle: the spindle can be clamped with the convertible clamping lever (10).



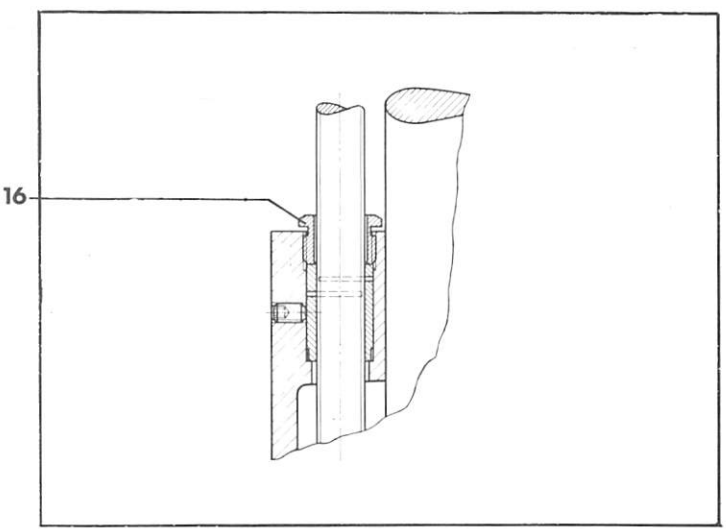
The Depth Stop:

If several holes of identical depth are to be drilled, it is possible to set the spindle stroke to the required dimension.
In practical use: when the spindle is in the lowered position, the stop ring (11) is fixed with the allen head screw (12). In this way the stroke of spindle is limited to the required depth.



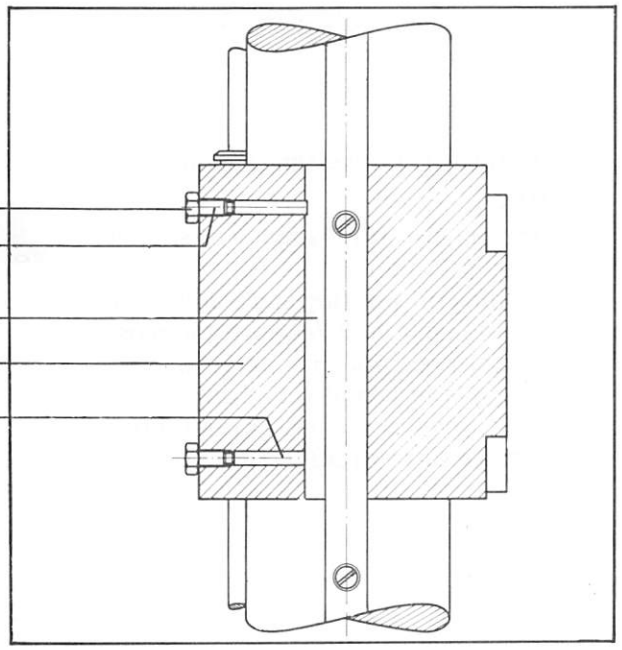
Adjusting the Height of the Vertical Unit:

The vertical unit can be adjusted in height by turning the handwheel (13), which activates the vertical screw (14). The vertical slide is clamped to the vertical column with the convertible clamping lever (15).



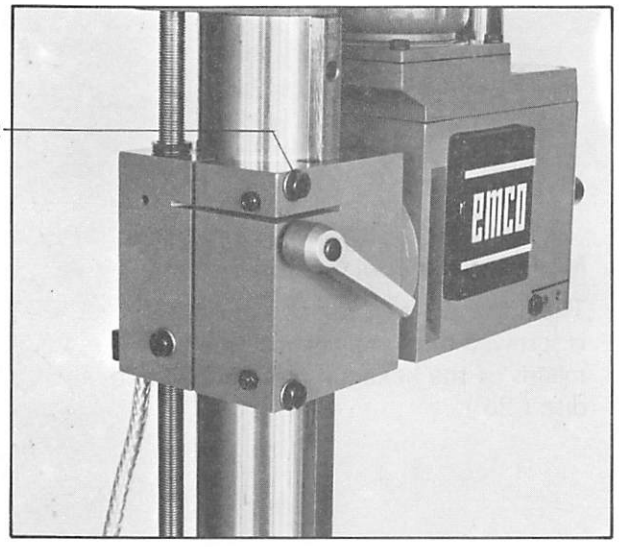
Readjustment of Play of the Vertical Slide in the Nut:

The threaded ring (16) is adjusted until the spindle again rests in the nut without play. A play-free height adjustment is especially necessary when a vertical feed movement takes place (for example, gear milling, when the vertical head is turned in horizontal position).



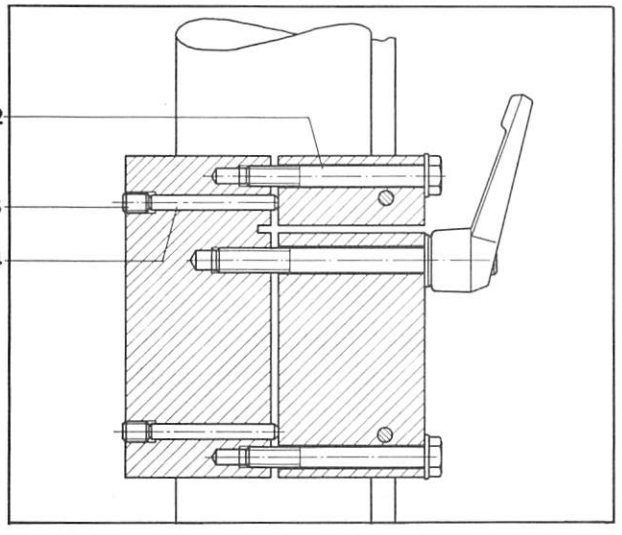
Readjustment of Play on the Guide Bar

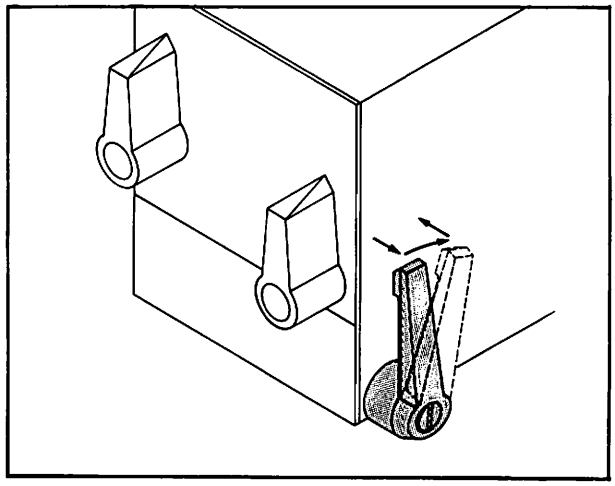
The vertical slide (17) is set in the factory to be play-free.
If necessary, the radial clearance can be compensated via both Allen head screws (18) over the pins (19) and the gib (20).The hexagon nuts (21) prevent loosening.



Readjustment of Play between the Vertical Slide and the Vertical Column

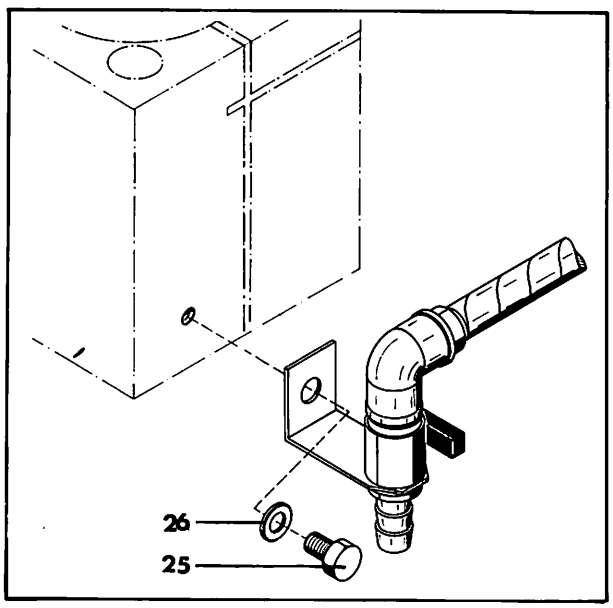
Loosen the set screws (23), tighten the hexagon head screws (22) until the vertical slide runs with no play and then re-tighten the set screws (23).





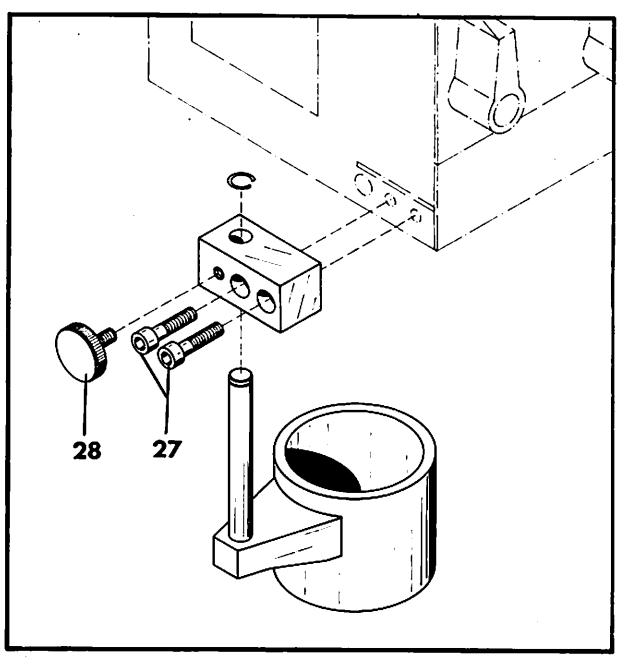
Re-setting the Convertible Clamping Lever:

(clamping lever for clamping of spindle and vertical slide).
Depending on working angle and height, the clamping lever is re-set to the most convenient position. The relative clamping lever is pulled out until it can be turned to the left or right. Possible angle turns of 30°.



Mounting the Coolant Hose:

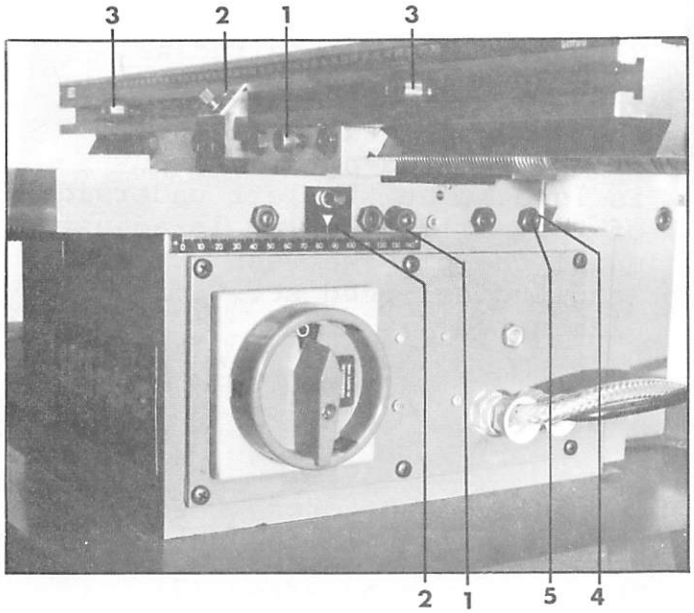
The angle plate of the coolant hose is screwed onto the vertical head by means of the hexagon screw (25) and disc (26).



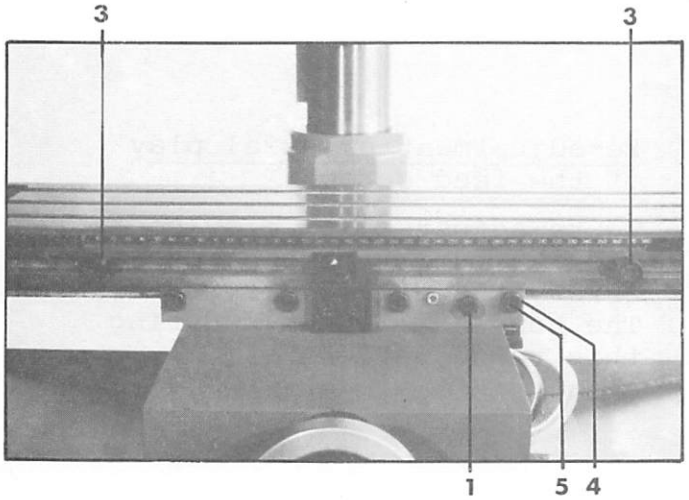
The Drilling and Milling Guard

The guard is clamped onto the vertical head with two Allen head screws (27). It is adjustable in height and can be fixed with the knurled screw(28) in the required position.

The Slides

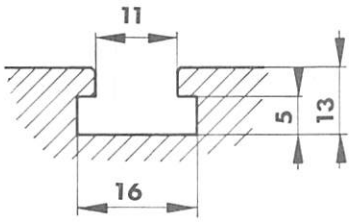


Milling (longitudinal) and cross slides run in adjustable dovetail guides and can be clamped with the allen head screws (1). The hand-wheels are fitted with adjustable scale rings (divisions: o.o25 mm with metric version; ... with inch version). The position indicators for milling table and cross slide (2) are adjustable; this facilitates reading of the travel.
The length of travel of the milling table can be limited with the two stop bolts (3) on the milling table to the required distance.



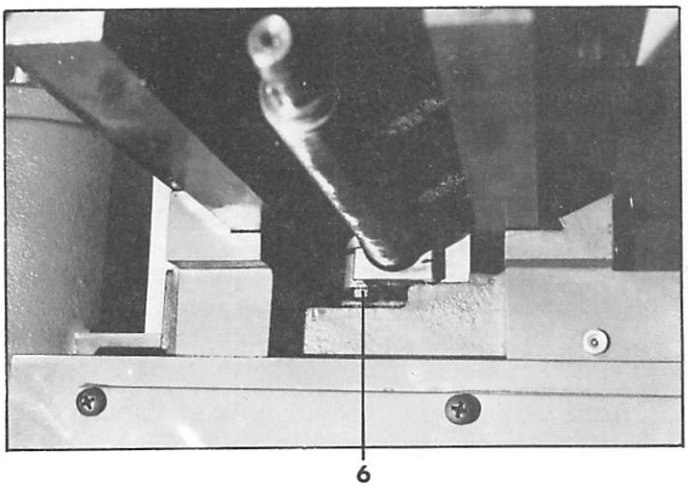
Re-adjustment of Milling Table and Cross Slide Dovetail Guides:

Milling table and cross slide are fitted with re-adjustment gibs. For adjustment, the 4 hexagon nuts (4) are loosened, and the set screws (5) are re-adjusted until the milling table or cross slide run without play again.
Afterwards, the hexagon nuts are retightened.
So that the set screws do not turn when tightening the nuts, they are held in re-adjusted position with a screwdriver.



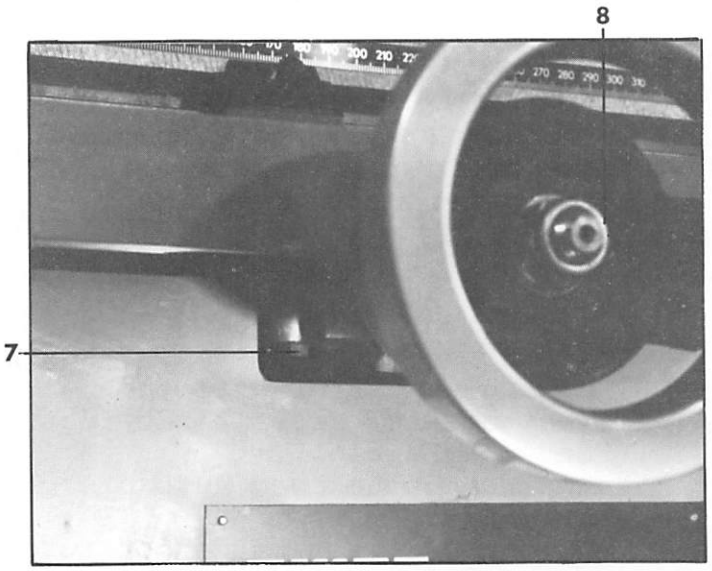
Dimensions of T-slots in the milling table and the angle plate

Distance between T-slots in the milling table: 1.772" (45 mm)



Compensation of longitudinal feed screw backlash in the nut:

The hexagon head screw (6) of the slotted nut (the nut is located at the left underside of the milling table) is adjusted until the play between nut and longitudinal feed screw is eliminated.



Compensation of cross feed screw backlash in the nut:

The hexagon head screw (7) of the slotted nut (the nut is located at the front underside of the cross slide) is adjusted until the play between nut and cross feed screw is eliminated.

Re-adjustment of axial play of the feed screws:

To re-adjust axial play of the milling table or the cross feed screw, the nut (8) is re-adjusted. The handwheel is held during this re-adjustment.

RECOMMENDED OILS AND LUBRICANTS

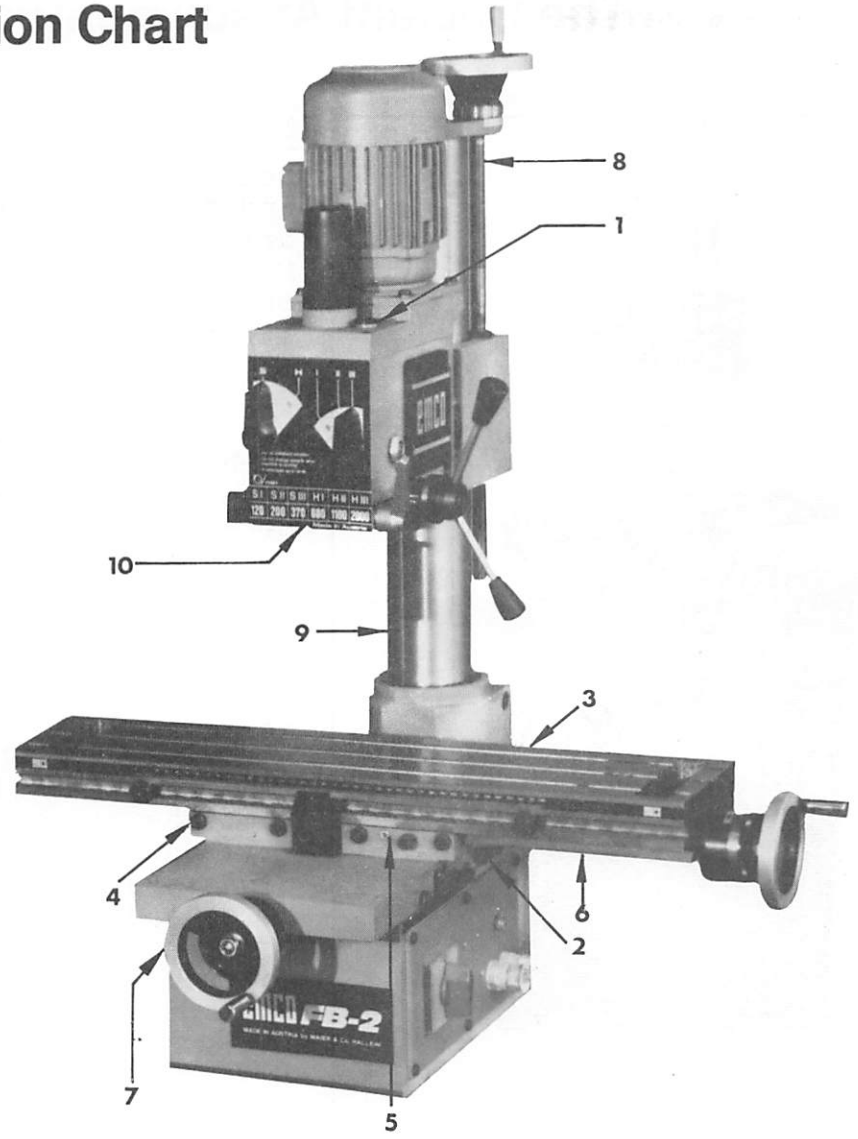
Gear of headstock, sliding elements:

Oil which is resistant to aging, non-foaming and rust-preventing.
Viscosity: 36-46 cSt at 40° Celsius
for example:CASTROL HYSPIN AWS 46

Greasing points:

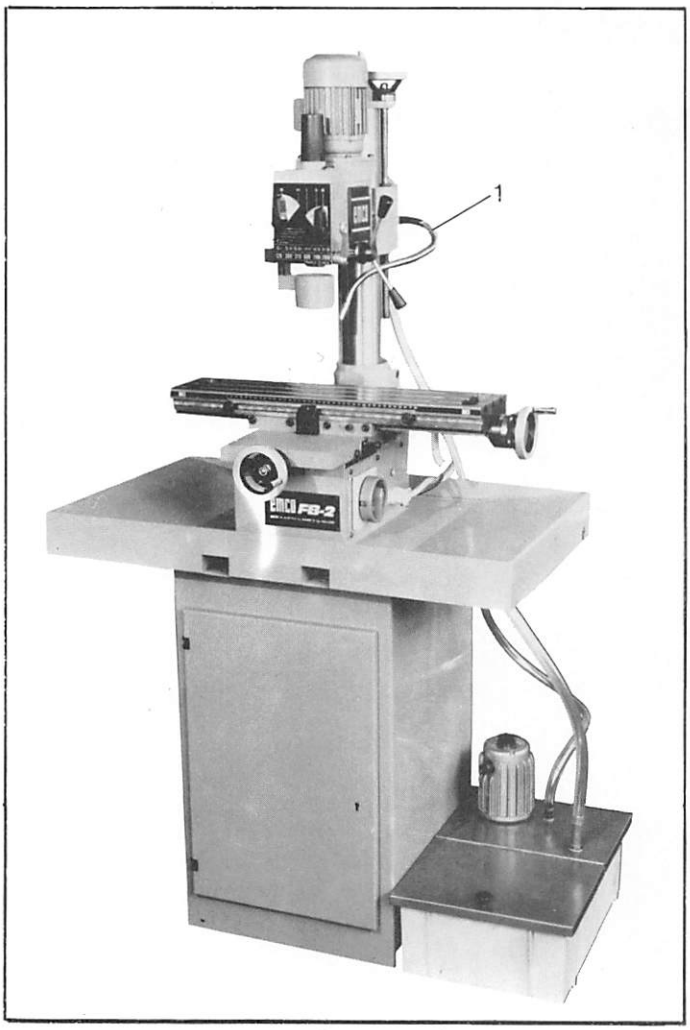
Lithium-saponified grease
for example: CASTROL SPHEEROL EPL 2

Lubrication Chart



Machine element	Pos.no.	Type of Lubrication	Tips
Gear of vertical head	1	Oil	Quantity:o.5 liter; oil change after approx. 3oo hours of use
Milling table and cross slide dovetail guides	2,3,4,5	Oil	a few thrusts with the grease(oil) gun, after approx. 24 hours of use
Longitudinal feed screw, cross feed screw	6,7	Grease	weekly
Vertical spindle	8	Oil	weekly
Column	9	Oil	weekly
Quill	1o	Oil	weekly

The Coolant Attachment

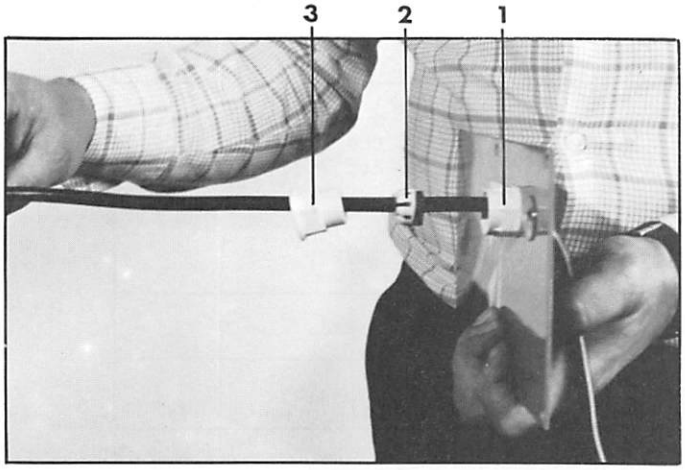


Mounting:

Before mounting, compare voltage and frequency of coolant pump and drive motor.
Mounting instructions for coolant pump are enclosed with coolant attachment.

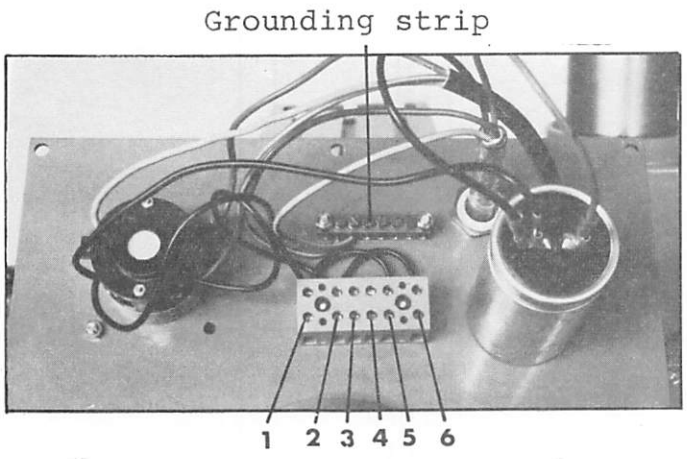
The coolant hose (1) is mounted with the angle plate, hexagon screw and washer to the rear of the vertical slide (see pp. 12). The drainage hose is connected to the tube on the right underside of the chip tray.

On the rear of the milling table two tapped holes are machined, through whigh the coolant runs off the milling table. It is recommended that the accessory coolant pipe be mounted: the two plastic angle pipes are mounted to the tapped holes and the two pipes are slipped onto the angles. This guarantees that the returning coolant does not spray over the chip tray.



ELECTRICAL CONNECTION OF THE COOLANT ATTACHMENT:

1. Remove plug from outlet.
2. Remove both covers on the machine base.
3. The basic element (1) is mounted on the left cover with the tightening nut (instead of the originally-mounted plug). The conical element(2) and the tightening element (3) are threaded onto the cable as indicated in the photograph. Left cover with rubber padding is mounted.



4. Clamping the wire ends

a) single-phase version:

Clamp grounding wire (yellow/green) to grouding strip.
The blue and brown wires (MP,R) are connected to contact points 5 and 6.

b) three-phase version:

Clamp grounding wire (yellow/green) to grounding strip.
The blue,brown and black wires are connected to contact points 4,5 and 6.

NOTE: If the pump motor runs in the incorrect direction, then two wires (for example, blue and brown) must be interchanged.

5. Remount right cover and rubber padding.

6. Fix cable on left cover with conical element and tightening element, see page 15.

Mounting and Dismounting of Tools and Arbors

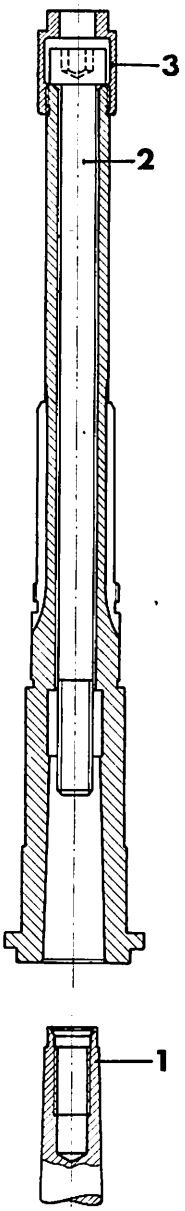
Tools with Morse taper shaft MT2 can be mounted directly.
Tools with cylindrical shaft or receiving bore are clamped with the corresponding clamping (3 jaw drill chuck, collet holder, shell end mill arbor).

ATTENTION:

+Spindle taper and tool taper must be dirt and dust-free

+Never work without top cover

+Never hammer the spindle - this could damage the precision bearings.



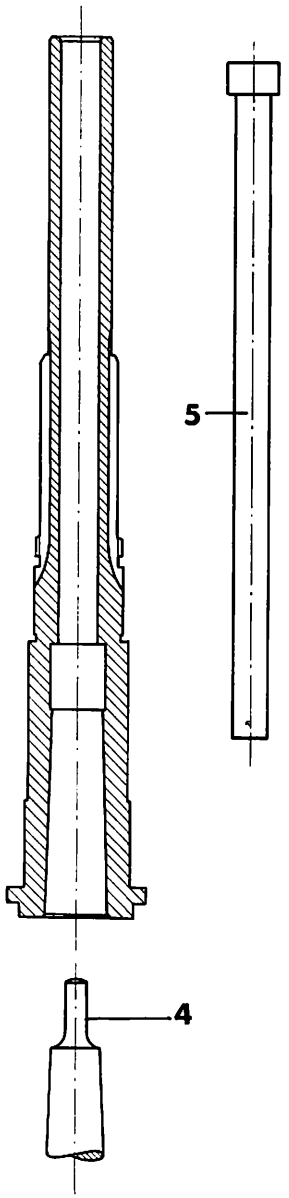
Clamping Method A,
for tools or arbors with internal draw-in screw thread (1).

Clamping:

The tool in inserted into the spindle and fixed with the allen head screw (2).

Dismounting:

The allen head screw (2) is turned counterclockwise, the head of the screw presses against the nut (3) and the tool or arbor is released.



Clamping Method B,
for tools or arbors with flat tang (4).

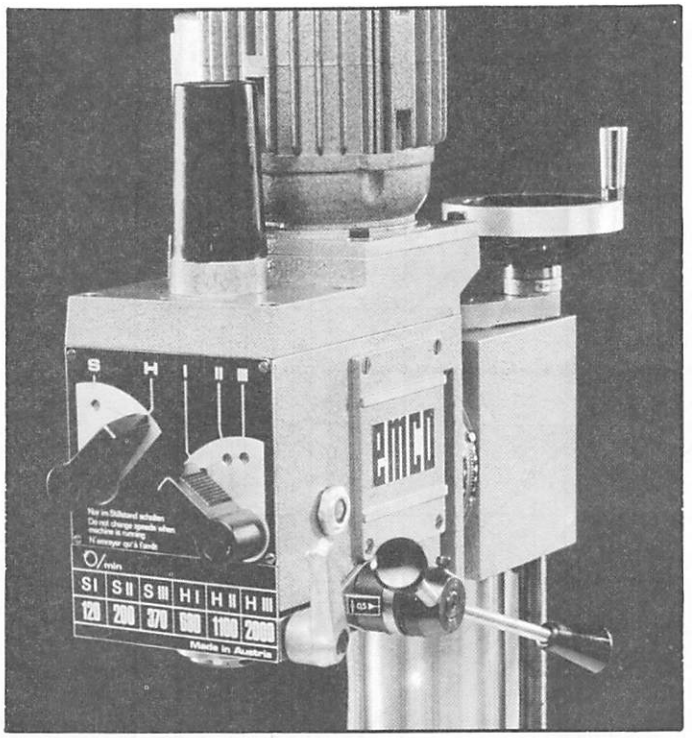
Clamping:

The allen head screw (2) and the rod are dismounted. The tool is inserted into the spindle.

Dismounting:

The rod (5) is inserted into the spindle. The nut (3) is screwed on until the tool is ejected by the pressure of the rod (5).

The Spindle Speeds



Switching spindle speeds is facilitated by the sloped sliding gears. If, however, the teeth are above one another, the spindle must be turned with the hand during switching.

ATTENTION:

+ Never change spindle speeds while machine is running!
+ Never switch with force, turn spindle during switching!
+ The switch must rest in the bore of the speed plate!

Guidelines for Spindle Speeds Depending on the Workpiece Material and Diameter of Milling/Drilling Tool.

The correct spindle speed is mainly dependent on two factors:

1. Strength of the workpiece material:

Generally applicable: the stronger the material (the harder the workpiece), the lower the speed.

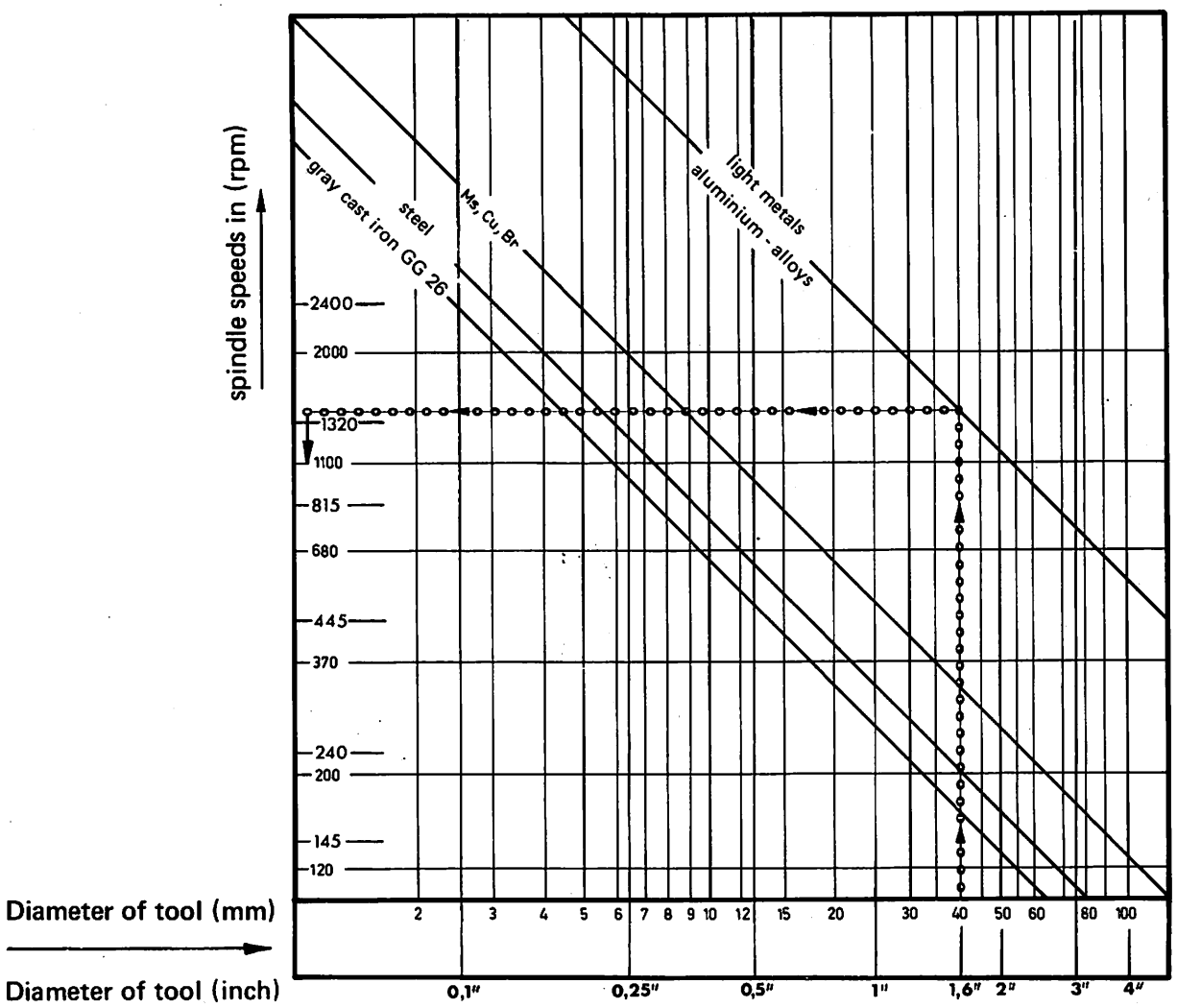
2. Diameter of the tool:

The larger the diameter of the milling tool (or drill), the lower the speed.

The guidelines as on the diagram are applicable:

1. when using optimally sharpened tools
2. when using the correct lubricating and coolant materials.

If cutting conditions are not the best (result:tool rattles,etc.) it is recommendable to work with a lower speed.

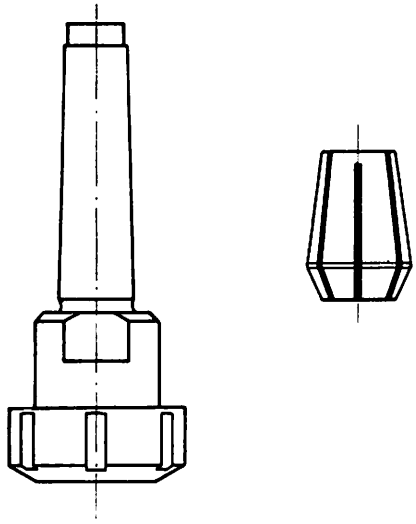


Example: Workpiece material: Aluminum alloy

Diameter of milling tool: 1.6 inch

One follows the broken line and comes to a speed of approx. 14oo rpm.
The selected speed must always be under the theoretical speed.
In this case 11oo rpm.

Clamping Devices for Tools



CLAMPING WITH THE COLLET HOLDER AND COLLETS

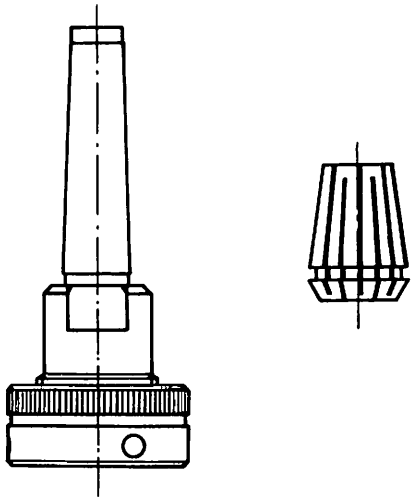
Clamping Method A

The collet holder enables clamping of milling tools with round shanks and of drills.

1. Collet Holder (Order No. 721 000) for Type E 25 Collets

For clamping with collets of Type E 25, you need the appropriate collet for each shank diameter. Clamping range: h 13. The clamping diameter is engraved on the collet. – For the Order Nos. of the E 25 collets, see the brochure.

The clamping nut is tightened with a hook spanner while counterforce is exerted with the key wrench.



2. Collet Holder (Order No. 520 000) for Type ESX 25 Collets

(available from mid-1981)

The collets of Type ESX 25 enable you to bridge greater clamping ranges (see table).
When the clamping nut is unscrewed, the collets are drawn off the cone of the collet holder by the annular ring round the collet waist.

The collets are available either as a set of 14 (Order No. 225 000) or separately.

The machine vice is fitted onto the cross slide using the T-slot screws. On the Maximat Super 11, it can also be clamped onto the angled plate and the milling table. For the screw dimensions, see the Spare Parts List.

Individual collets ESX-25

Nominal diameter in mm	Chucking capacity in mm	Chucking capacity in inches	Order No.
2,0	1,5-2,0	1/16-5/64	**225 020**
2,5	2,0-2,5	3/32	**225 025**
3,0	2,5-3,0	7/64	**225 030**
4,0	3,0-4,0	1/8-9/64-5/32	**225 040**
5,0	4,0-5,0	11/64-3/16	**225 050**
6,0	5,0-6,0	13/64-7/32-15/64	**225 060**
7,0	6,0-7,0	1/4-17/64	**225 070**
8,0	7,0-8,0	9/32-19/64-5/16	**225 080**
9,0	8,0-9,0	21/64-11/32	**225 090**
10,0	9,0-10,0	23/64-3/8-25/64	**225 100**
11,0	10,0-11,0	13/32-27/64	**225 110**
12,0	11,0-12,0	7/16-29/64-15/32	**225 120**
13,0	12,0-13,0	31/64-1/2	**225 130**
14,0	13,0-14,0	33/64-17/32-35/64	**225 140**

Important Note:

Collets of Type ESX 25 can be used in collet holder 721 000. However, collets of Type E 25 do not fit into collet holder 520 000.

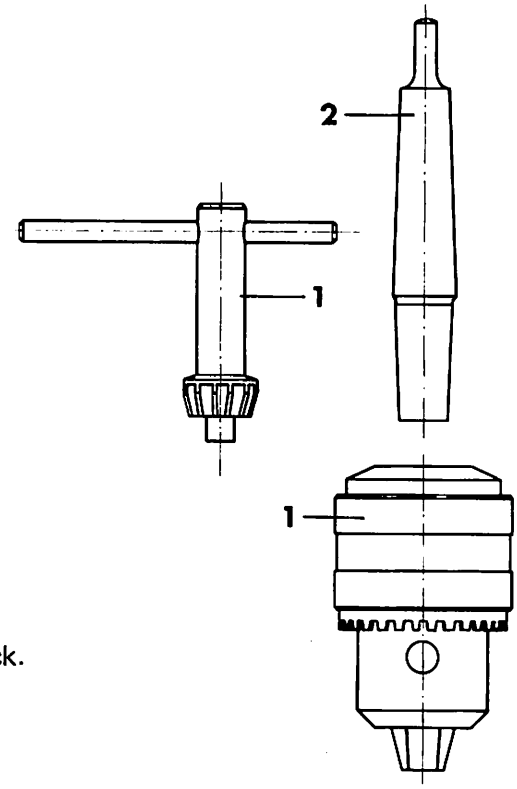
CLAMPING IN THE DRILL CHUCK

Clamping Method for Drill Chuck: B

Necessary accessories:

* 3 jaw drill chuck with key (1)
* Morse taper arbor MT2 (2)

Drills with cylindrical diameter of up to 0.52" (13 mm) can be clamped in the 3 jaw drill chuck.



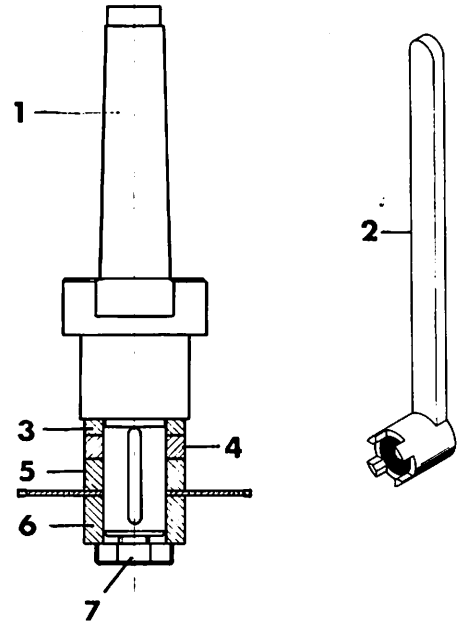
CLAMPING IN THE SHELL END MILL ARBOR

Clamping Method A (for shell end mill arbor)

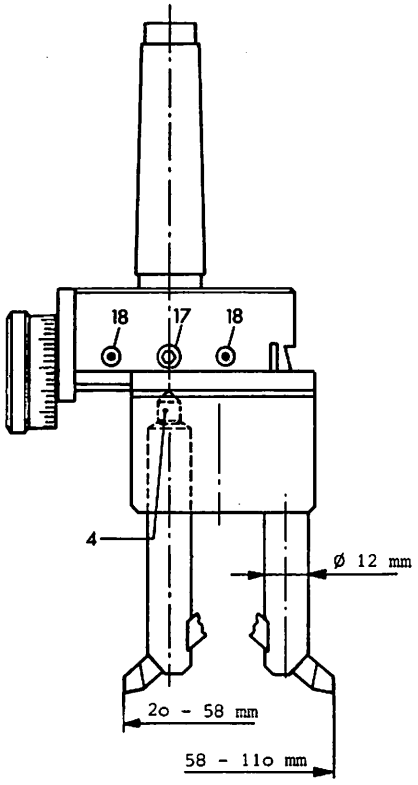
Necessary accessories:

* shell end mill arbor (1)
* special key (2)
* **Set of 4 collars**
  - spacing collar 4 mm (3)
  - spacing collar 6 mm (4)
  - spacing collar 8 mm (5)
  - spacing collar 12 mm (6)

Tools with a receiving bore of 16 mm diameter (milling cutters, staggered tooth side milling cutters, circular saw blades) are clamped against the collar of the shell end mill arbor over the spacing collars (3,4,5,6) with the clamping screw (7).
The special key (2) is used for tightening.



BORING AND FACING HEAD (FLY CUTTER)



Technical Data:

On the slide two bores of 12 mm (0.5″) dia. are machined.

Toolholder in left bore:
Smallest diameter: 20 mm (0.8″)
Largest diameter: 58 mm (2.3″)

Toolholder in right bore:
Smallest diameter: 58 mm (2.3″)
Largest diameter: 110 mm (4.4″)

Dimensions of turning tools: 6 x 6 mm (1/4″ x 1/4″)
Scale divisions: 0.025 mm

Working tip:

Before machining, clamp the cross slide with the set screw (17).

Adjusting tips:

— Adjustment of playfree guidance is done with the set screws (18).

— By adjusting the set screw (4) the backlash of leadscrew is eliminated.

Tools

All Tools of HSS Quality

Heavy-duty taper shank end mill, 8 mm dia. for roughing cut, cylindrical shaft;

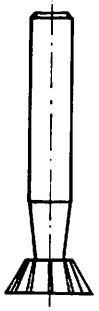
Clamping: with collet chuck attachment

Heavy-duty taper shank end mill, 15 mm dia., for roughing cut, Morse taper MT2;

Clamping: direct clamping according to Method A

Dovetail milling cutter, 16 mm dia. x 60° with cylindrical shaft 12 mm dia.

Clamping: with collet chuck attachment



Two flute slot drill with cylindrical shaft, 3,4,5,6 mm dia.

Clamping: with collet chuck attachment

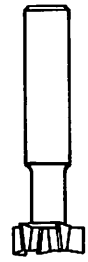
Twist drills, HSS, DIN 338
1 - 13 mm in steps of 1/2 mm,
1 set consists of 25 pieces

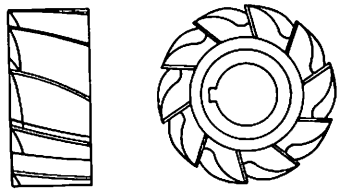
Clamping: with drill chuck or collet chuck attachment

T–slot cutter, 12,5 mm dia. x 6 mm cylindrical shank, 10 mm

T–slot cutter 16 mm dia. x 8 mm cylindrical shank, 10 mm

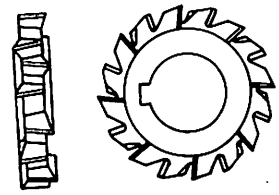
Clamping: with collet chuck attachment





Heavy-duty shell end mill, with spiral for roughing/finishing, outside dia. 40 mm, width 20 mm, dia. of bore 16 mm.

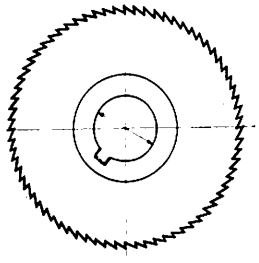
Clamping: with shell end mill arbor



Staggered tooth side milling cutter, dia. of cutter 35 mm, width 5 mm, bore 16 mm

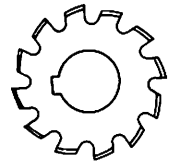
Staggered tooth side milling cutter, outside dia. 50 mm, width 6 mm, bore 16 mm

Clamping: with shell end mill arbor



Circular saw blade, fine tooth, dia. of blade 60 mm, width 0,8 mm, bore 16 mm.

Clamping: with shell end mill arbor

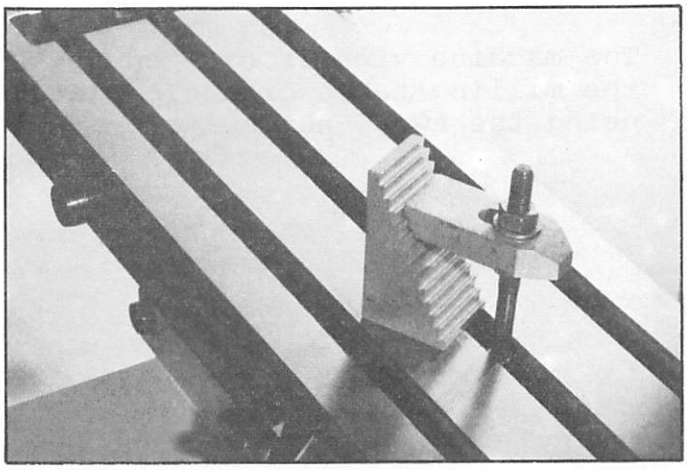


Gear milling cutters, relieved for 20° pressure, bore 16 mm

module 0,5
module 1
module 1,25

available in set of 8 pieces or individually

Clamping Devices for Workpieces



CLAMPING WITH THE STEPPED CLAMPING SHOES

Clamping height: 2.36" (6o mm)

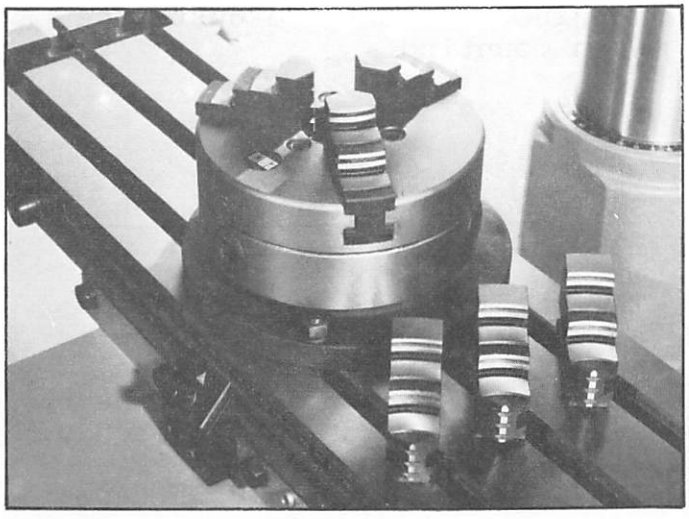
Large-surfaced workpieces can be clamped to the cross slide with the stepped clamping shoes. Depending on the shape of the workpiece, two or more clamping shoes are necessary in order to clamp the workpiece securely.

CLAMPING WITH THE LATHE CHUCK 125 mm dia.

Necessary accessories:

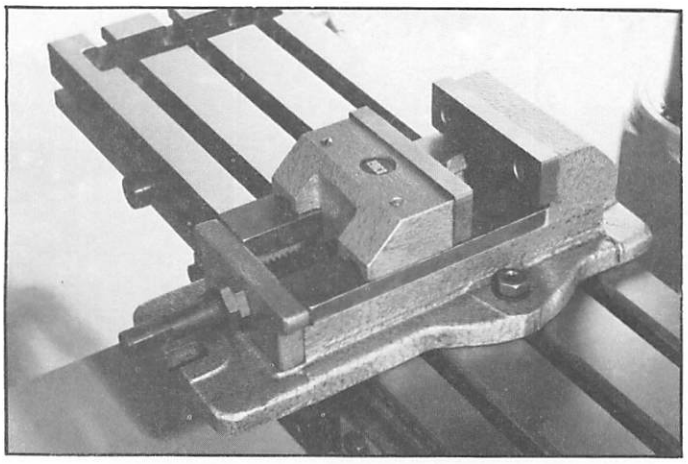
+ Lathe chuck 125 mm dia.

+ Adaptor plate



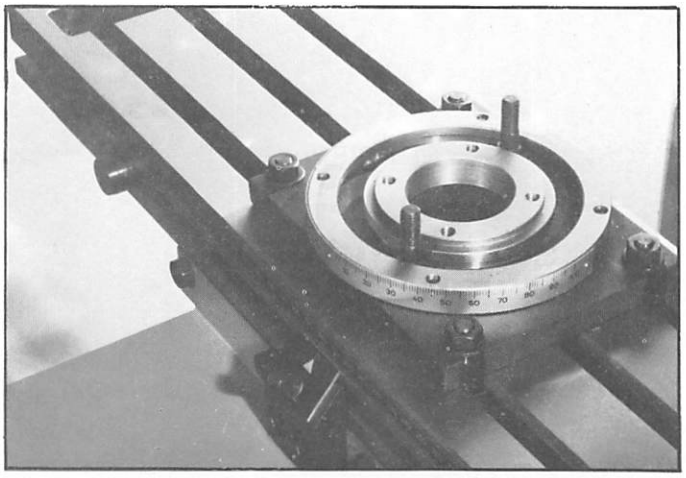
The 3 bolts are put into the lathe chuck with the short threaded ends. The chuck is mounted to the adaptor plate with the hexagon nuts. Depending on the work requirements, the adaptor plate with chuck is mounted on the milling table or the angle plate.

NOTE:
The lathe chuck is equipped with one set of internally-stepped jaws and one set of externally-stepped jaws. When changing jaws, one must note that jaw no.1 is placed in groove no.1, jaw no.2 in groove no.2, etc.



CLAMPING WITH THE MACHINE VICE

Width of jaws: 3.3o" (84 mm)
Clamping capacity: up to 3.15" (8o mm)
The machine vice is clamped to the milling table or angle plate using the two T-nut bolts.

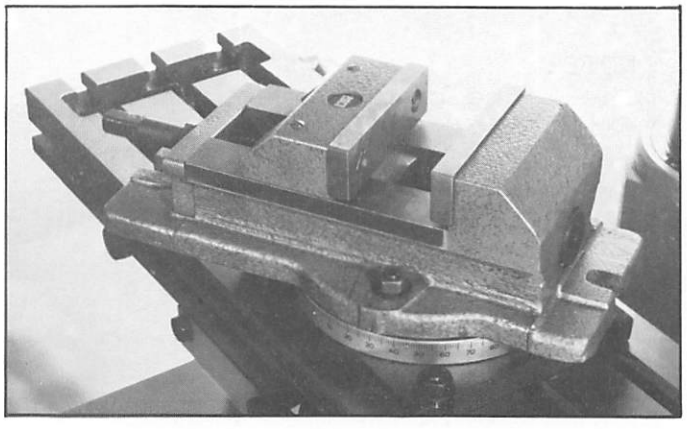


THE SWIVEL BASE FOR THE MACHINE VICE

The swivel base is mounted to the milling table with 4 T-nut bolts, washers and hexagon nuts. The base is positioned on the milling table by means of 2 guide pins, which fit into the T-slots of the milling table.

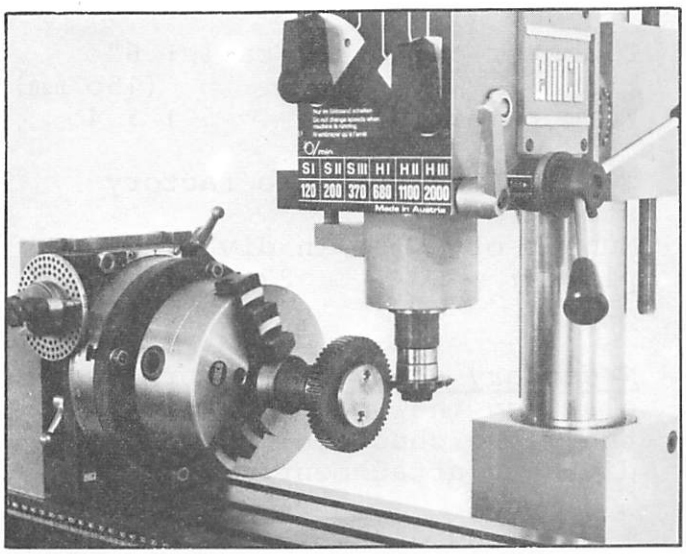
The machine vice is placed on the base and fixed with the 2 T-nut bolts and hexagon nuts.
The machine vice is centered with the centering ring.

NOTE:
The centering ring and all other contact surfaces of the base and machine vice must be dust-free when mounting.



Scribing the Zero-mark on the machine vice

The machine vice is positioned so that the fix clamping jaw is parallell to the longitudinal slide. In this position, the zero-mark is made on the machine vice with a scriber.
The positioning itself is done with the aid of a dial gauge or with an arbor inserted in the spindle taper.



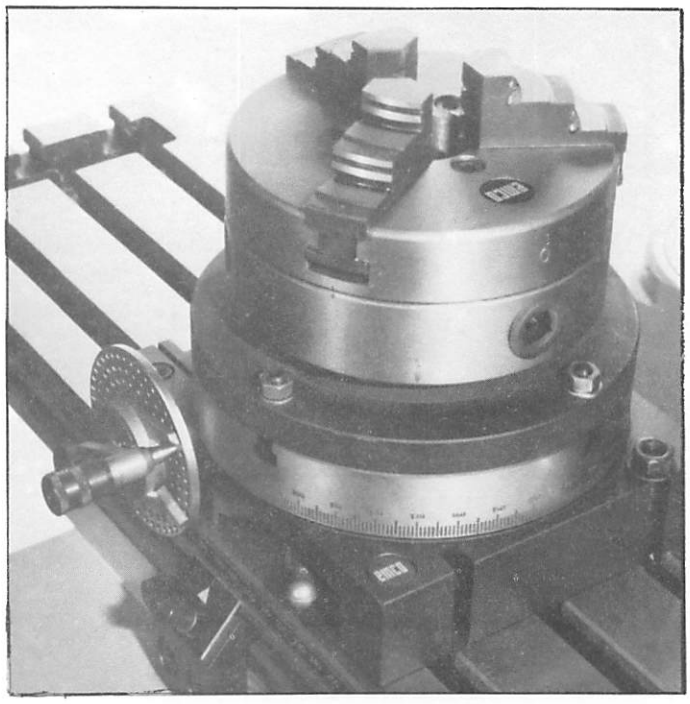
THE ANGLE PLATE

Clamping surface: 6.9"x5.5"
(175 x14o mm)

Distance of T-slots: 3.54"
(9omm)

Workpieces can be clamped directly with the clamping shoes or with the machine vice, lathe chuck or dividing attachment with mounted lathe chuck.

The Dividing Attachment



TECHNICAL DATA

Diameter of rotary table: 6"
(15o mm)
Worm reduction 1 : 4o

T-slots according to factory standard
Number of holes in dividing plates: 27,33,34,36, 38,39,4o,42

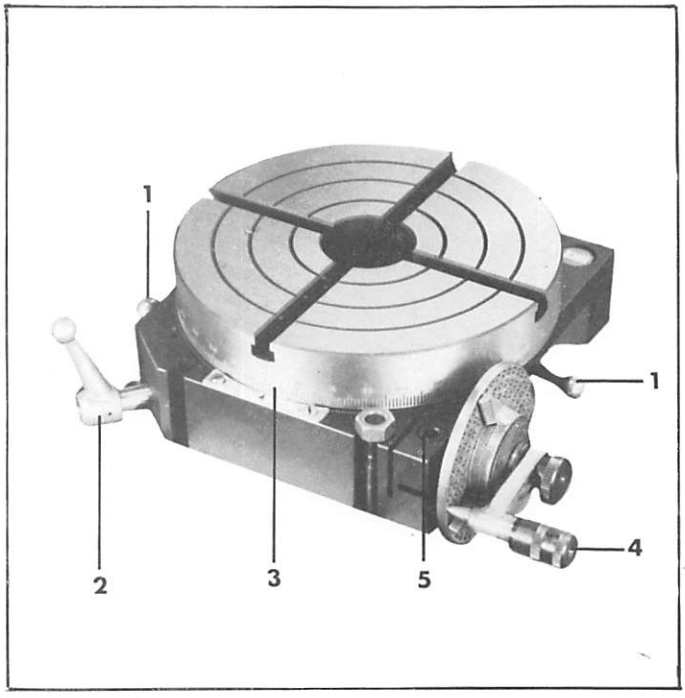
Necessary accessories for clamping the workpieces in the lathe chuck on the dividing attachment:

+ Dividing attachment
+ Adaptor plate
+ Lathe chuck 125 mm dia.

OPERATING ELEMENTS

Clamping levers for rotary table (1):
Clamping levers are loosened during the dividing operation itself, but must be clamped before every machining operation.

Indexing pin with handle (2):
During direct dividing from 15^{o} to 15^{o}, the pin rests into the parameter notches of the rotary table. During indirect dividing (worm dividing) or free dividing by means of the graduated scale, the indexing pin must be pulled out and swivelled to the left.

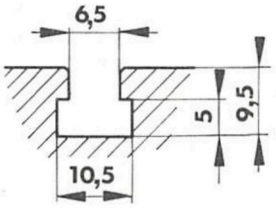


The graduated scale (3) for controlling the divisions.

Crank handle with index plunger (4) move the worm which is engaged with the worm-wheel of the rotary table during indirect dividing.

The shears serve to facilitate adding the number of holes when a fraction of a turn is to be added.

T-slots of the Dividing Attachment



Disengaging and Engaging the Worm:

The allen head screw (5) is loosened. When the dividing plate is turned counterclockwise, the worm and wormwheel are disengaged. The rotary table can be turned by hand for direct indexing.
By turning the dividing plate clockwise, worm and wormwheel are engaged. To facilitate engagement of worm and wormwheel, the rotary table should be moved slightly by hand.
The allen head screw (5) must again be tightened after this operation.

TYPES OF DIVIDING

Indirect Dividing:

Indirect dividing affords more dividing possibilities and is more accurate because of the worm reduction of 1:40.
Indirect dividing method:
If the crank handle is turned 40 times, the rotary table makes 1 revolution (360°).
With help of the dividing plates, exact fractions of turns can be executed.

Direct Dividing:

Worm and wormwheel are disengaged.
Possibility 1:
dividing by means of the indexing pin (2). Dividing possibility from 15° to 15° (i.e., maximum of 24 divisions within 360°).

Possibility 2:
The dividing can be done freely with the aid of the graduated scale on the rotary table.

The Indexing Table:

1st column: indicates number of divisions per 360°
2nd column: shows the corresponding angle of the division
3rd column: shows the number of 360° crank handle revolutions which are necessary
4th column: shows the number of holes to be added for each index plate

INDEX TABLE for MAXIMAT

Formula for the Calculation of the Hole Numbers Required

z = No. of divisions required for one revolution of the workpiece.

K = No. of revolutions of handle for a complete revolution of the workpiece.

n = No. of revolutions of handle for one dividing move: $n = \frac{K}{z}$

Worm reduction of dividing head 1:40; i. e. K = 40.

Division Desired	Degrees	No. of crank turns req'd	Amount of holes to be added for each index plate							
			27	33	34	36	38	39	40	42
2	180°	20								
	175°	19	12							
	170°	18	24							
	160°	17	21							
	150°	16	18							
	140°	15	15							
	130°	14	12							
	125°	13	24							
3	120°	13	9	11		12		13		14
	110°	12	6							
	100°	11	3							
4	90°	10								
	80°	8	24							
	75°	8	9	11		12		13		14
5	72°	8								
	70°	7	21							
	65°	7	6							
6	60°	6	18	22		24		26		28
	55°	6	3							
7		5								30
	50°	5	15							
8	45°	5								
9	40°	4	12			16				
10	36°	4								
11		3		21						
12	30°	3	9	11		12		13		14
13		3						3		
14		2								36
	25°	2	21							
15	24°	2	18	22		24		26		28
16		2			17	18	19		20	21
17		2			12					
18	20°	2	6			8				
19		2					4			
20	18°	2								
	16°	1	21							
21		1								38
22		1		27						
24	15°	1	18	22		24		26		28
25		1							24	
26		1						21		
27		1	13							
28		1								18
30	12°	1	9	11		12		13		14

Division Desired	Degrees	No. of crank turns req'd	Amount of holes to be added for each index plate							
			27	33	34	36	38	39	40	42
32		1				9			10	
33		1		7						
34		1			6					
35		1								6
36	10°	1	3			4				
38		1					2			
39		1						1		
40	9°	1								
42										40
44				30						
45	8°		24			32				
48						30				35
50									32	
	7°		21			28				
52								30		
54			20							
55				24						
56										30
60	6°		18							
64									25	
65								24		
66				20						
68					20					
70										24
72	5°		15			20				
76							20			
78								20		
80					17	18	19		20	21
84										20
85					16					
88				15						
90	4°		12			16				
95							16			
96						15				
100									16	
120	3°		9	11		12		13		14
180	2°		6			8				
200									8	
240						6				7
270			4							
360	1°		3							
	40′		2							
	30′					2				
	20′		1							

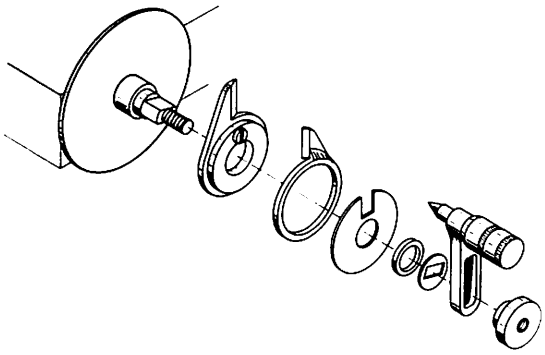
EXAMPLE OF AN INDIRECT DIVIDING OPERATION:

Desired division: 13 divisions in 360°

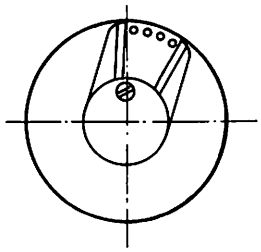
From the Indexing Table it can be seen that at the desired division 13, 3 full crank turns must be made plus a fraction turn of 3 additional holes on the indexing plate 39.

Practical Execution:

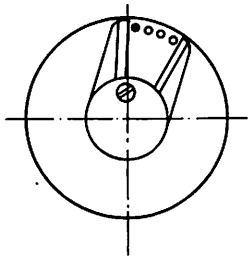
1. The indexing plate with 39 holes is mounted.



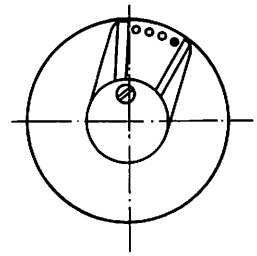
2. In the 4th column of the Indexing Table, one sees that at the 39 plate, 3 holes have to be added. Therefore, the shears are fixed so that they include 4 holes.



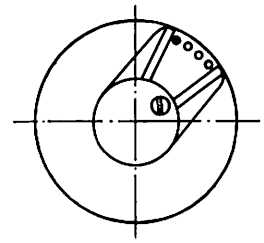
3. The indexing plunger is placed in a hole of the 39 (marked black on the drawing) and the left shear arm moved until it touches the pin of the plunger.



4. Execution of the Dividing Operation:
   3 full turns plus the fractional turn of the 3 added holes are made; that means that the plunger is placed in the black hole.
   One dividing operation is completed.



5. Next Dividing Operation:
   The shears are turned until the left arm touches the pin again; the next dividing operation follows as described in 4. above.

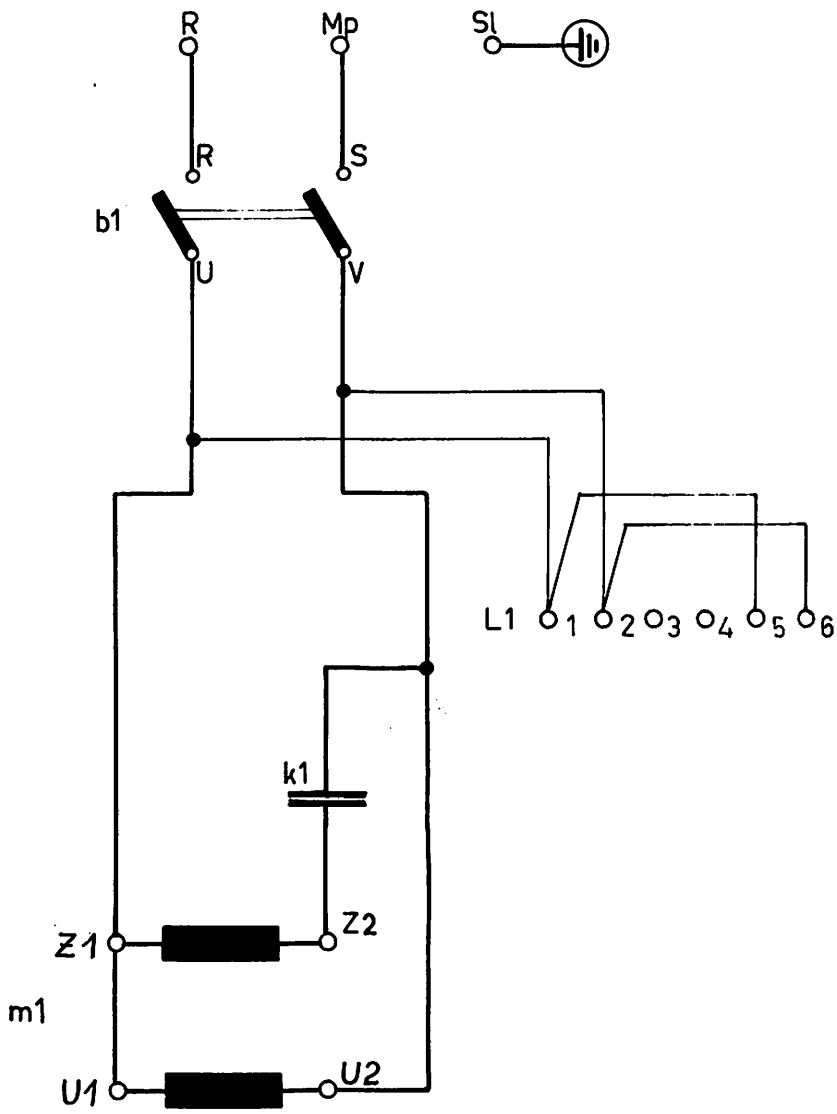


NOTE:
The shears may not be moved during the dividing operation, otherwise they do not serve their purpose as an orientation aid.

Circuit Diagram

single phase

FB – 2



b1 Motor switch

k1 Condenser

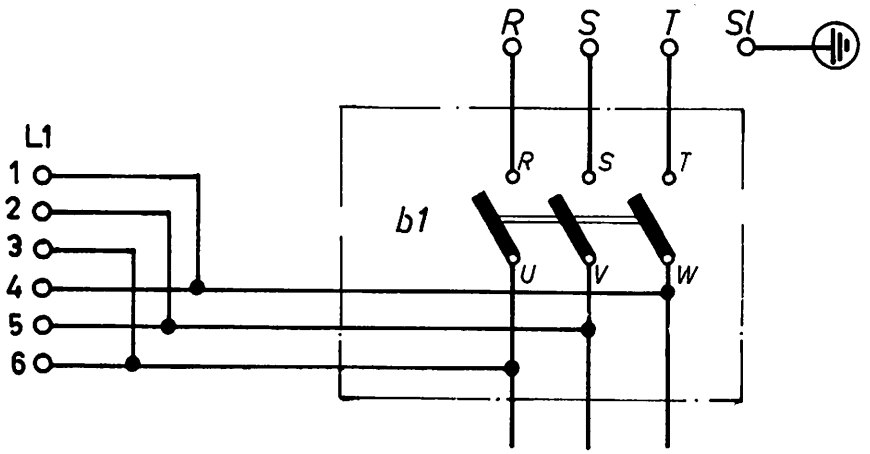
m1 Motor

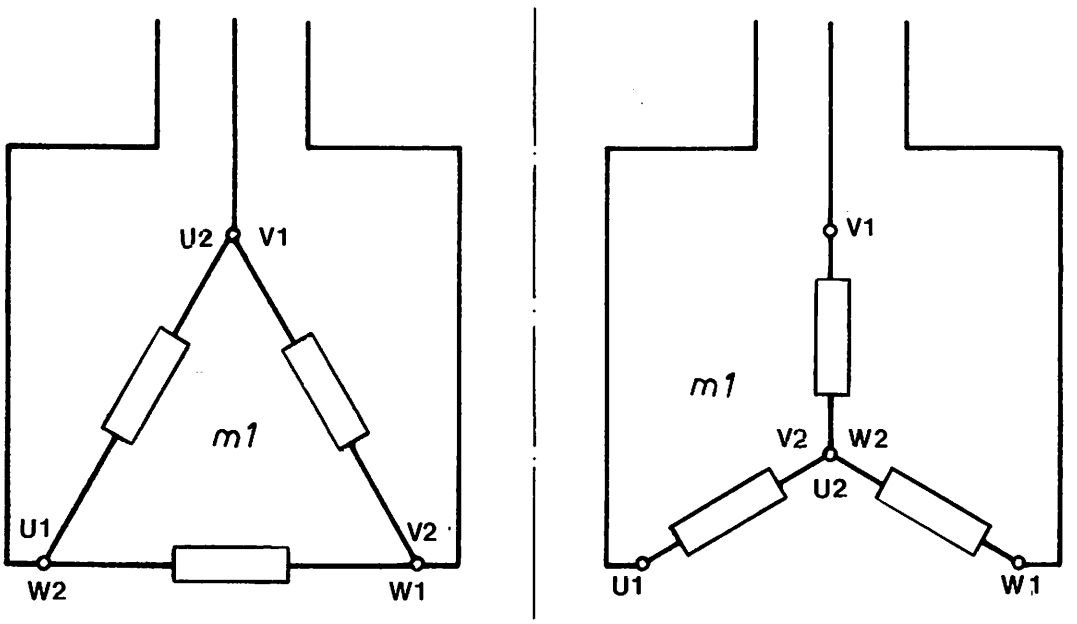
L1 Connection strip

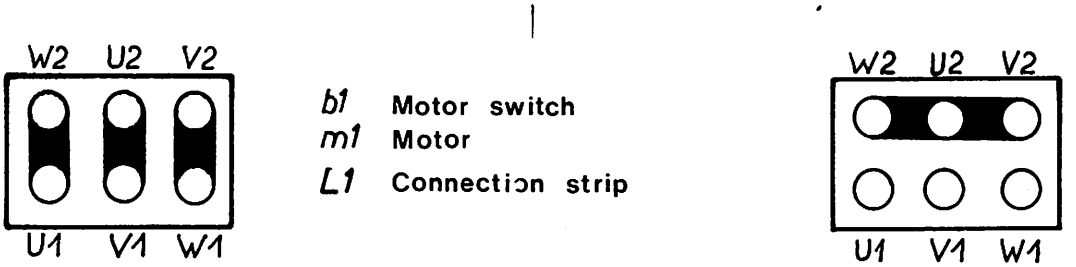
Circuit Diagram

three phase

FB – 2







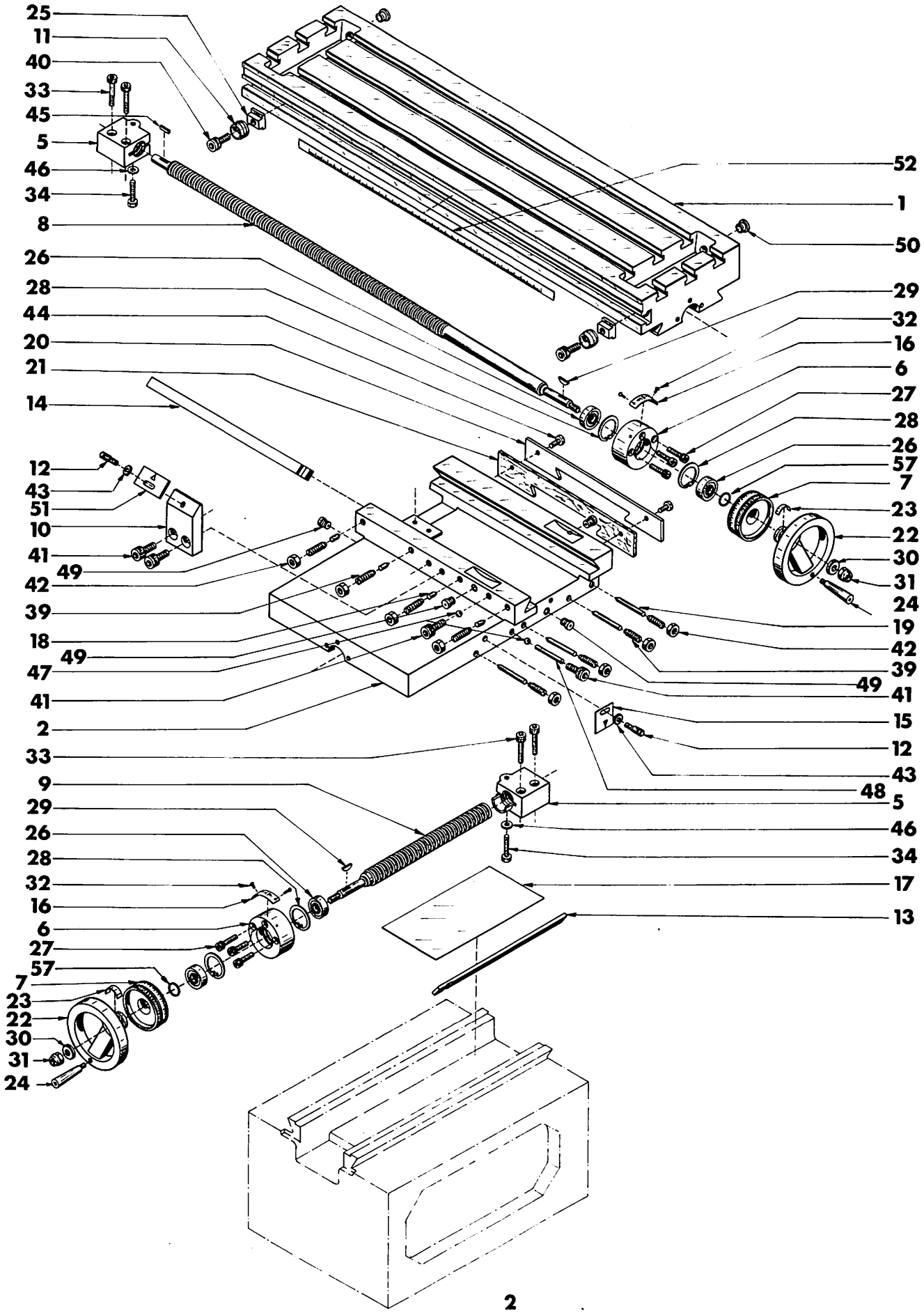
b1 Motor switch
m1 Motor
L1 Connection strip

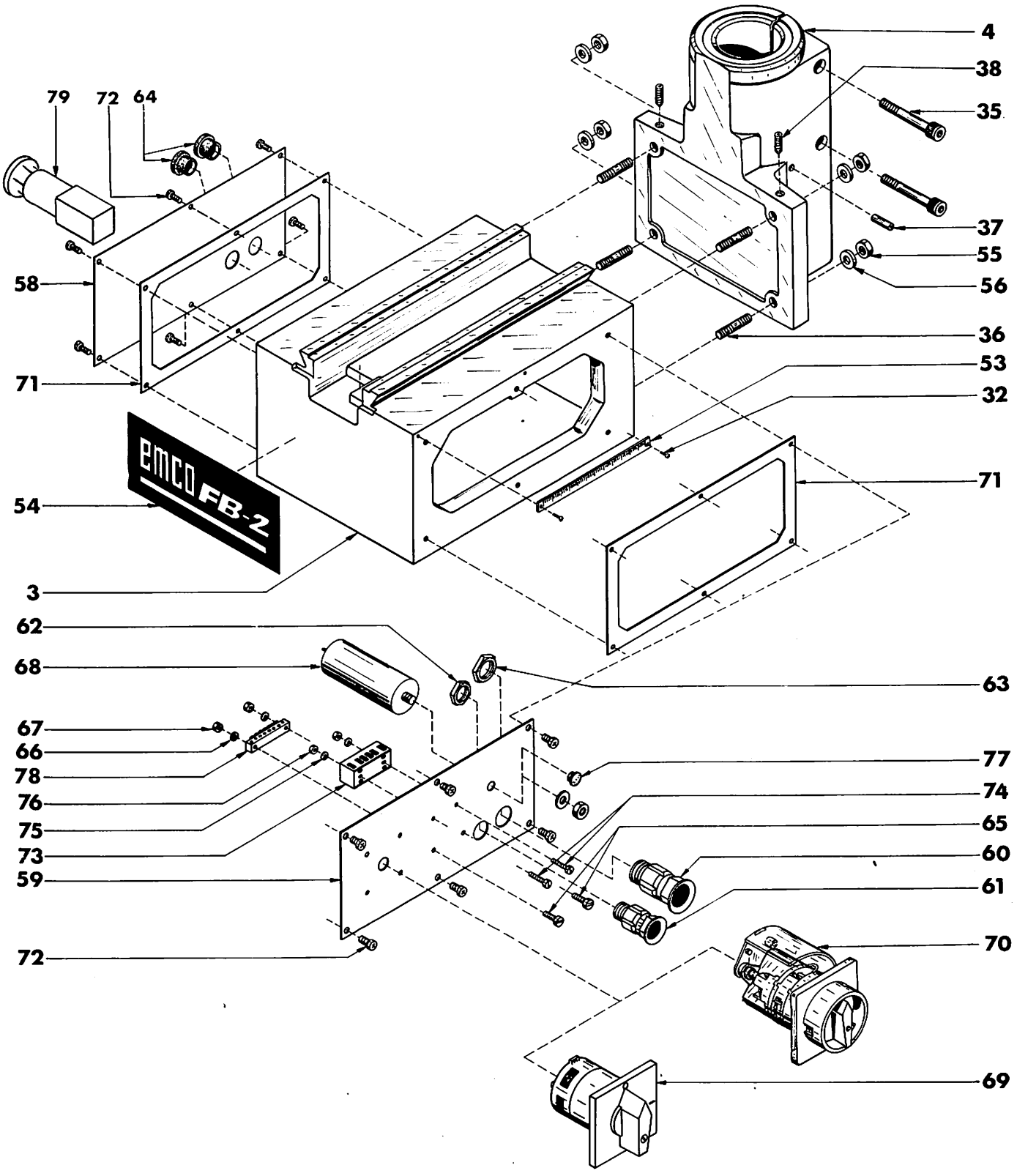
△ or Y connection see Motor capacity Plate

SERVICETEILE

SERVICE PARTS

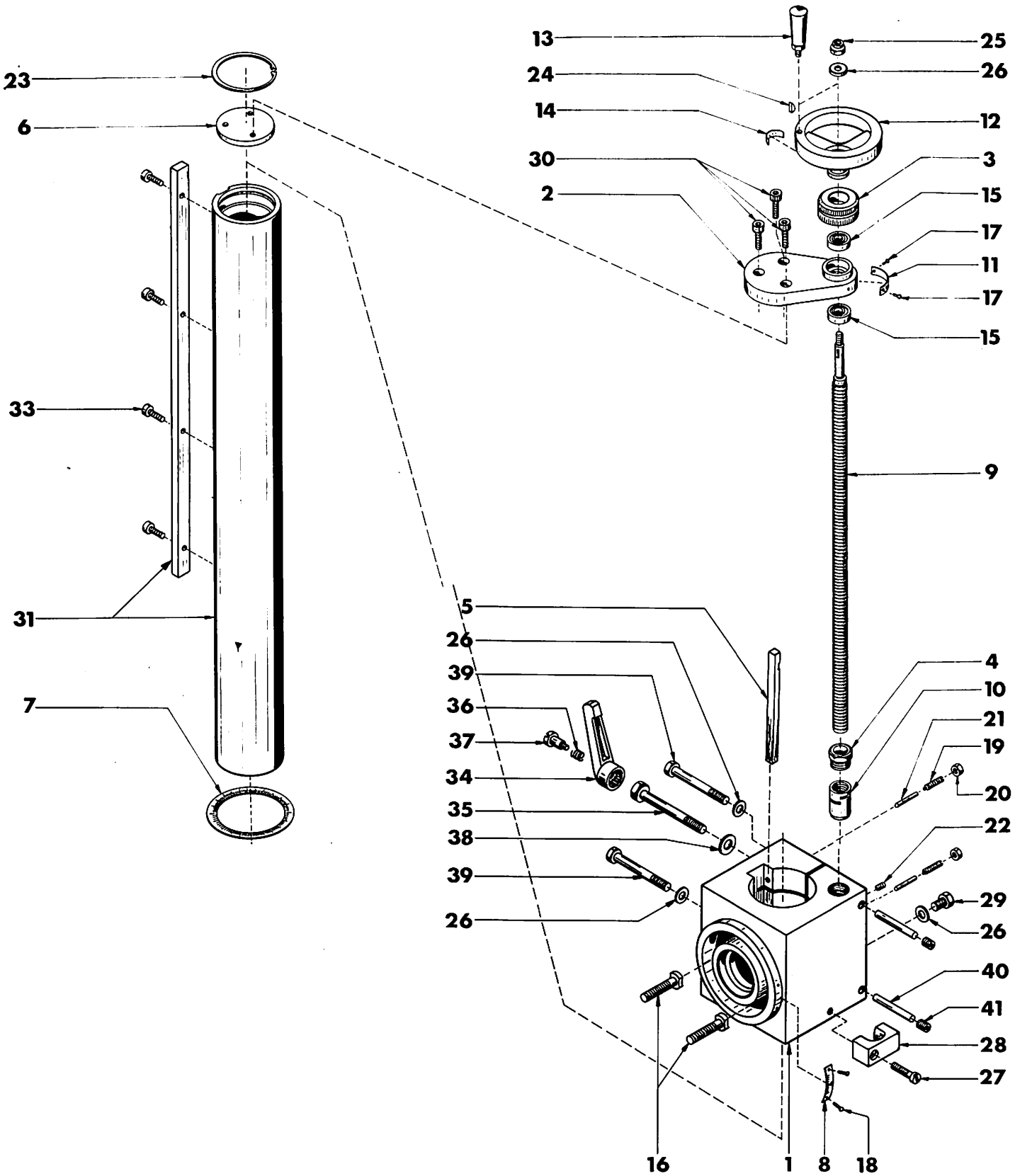
PIECES DE SERVICE


25
11
40
33
45
5
46
34
8
26
28
44
20
21
14
12
43
51
10
41
49
42
39
18
49
47
41
2
33
9
29
26
28
32
16
6
27
57
7
23
22
30
31
24
52
1
50
29
32
16
6
27
28
26
57
7
23
22
30
31
24
19
42
39
49
41
15
12
43
48
5
46
34
17
13

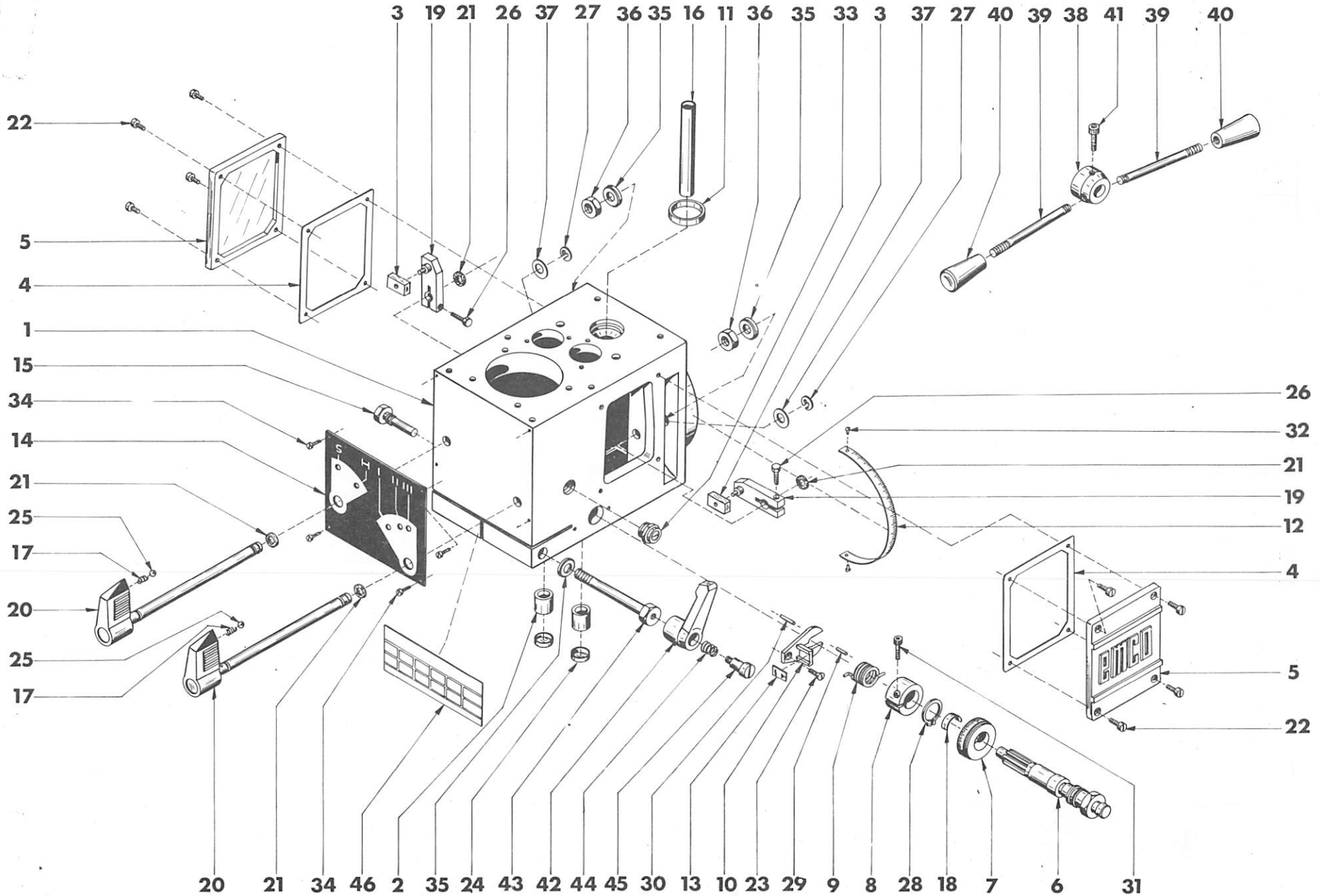

4
38
35
37
55
56
36
53
32
71
71
54
3
62
68
63
67
66
78
76
75
73
59
72
77
74
65
60
61
70
69
79
72
64
58
71
EMCO FB-2

Pos	Ref. Nr.	DIN		Benennung	Description	Designation
1	F2A 000 010			Frästisch	Milling table	Table de fraisage
2	F2A 000 020			Schlitten	Slide	Chariot
3	F2A 000 030			Sockel	Pedestal	Socle support
4	F2A 000 040			Säulenträger	Column support	Support-colonne
5	F2A 000 050			Mutter metr.	Nut metr.	Ecrou metr.
	F2B 000 050			Mutter USA	Nut USA	Ecrou USA
6	F2A 000 060			Spindelträger	Screw mount	Porte-broche
7	F2A 000 070			Skalenring metr.	Graduated ring metr.	Bague graduée metr.
	F2B 000 070			Skalenring USA	Graduated ring USA	Bague graduée USA
8	F2A 000 090			Längsspindel metr.	Longitudinal feed screw metr.	Vis filetée longitudinale metr.
	F2B 000 090			Längsspindel USA	Longitudinal feed screw USA	Vis filetée longitudinale USA
9	F2A 000 100			Querspindel metr.	Cross feed screw metr.	Vis filetée transversale metr.
	F2B 000 100			Querspindel USA	Cross feed screw USA	Vis filetée transversale USA
10	F2A 000 110			Anschlag	Stop	Butée
11	F2A 000 120			Anschlagbolzen	Bolt	Tige de butée
12	F2A 000 130			Klemmschraube	Clamping screw	Vis de serrage
13	F2A 000 140			Nachstelleiste	Gib	Lardon de réglage
14	F2A 000 150			Nachstelleiste	Gib	Lardon de réglage
15	F2A 000 160			Positionsschild	Setting mark	Plaque de position
16	D1A 020 070			Schild metr.	Scale mark metr.	Echelle metr.
	D1B 020 070			Schild USA	Scale mark USA	Echelle USA
17	F2A 000 180			Deckblech	Cover sheet	Tôle de protection
18	F2A 000 190			Druckbolzen 1	Adjusting pin 1	Boulon de pression 1
19	F2A 000 200			Druckbolzen 2	Adjusting pin 2	Boulon de pression 2
20	F2A 000 210			Abstreifblech	Wiper plate	Plaquette de racleur postérieur
21	F2A 000 220			Abstreiffilz	Felt wiper	Racleur en feutre postérieur
22	B4A 040 011			Handrad 100	Handwheel	Volant
23	B2A 000 080			Bogenfeder	Feed spring	Ressort arqué
24	B2A 013 000			G. Kegelgriff	Handle	Levier spherique
25	D1Z 250 060			T-Nutenstein	T-nut	Ecrou en T
26	ZLG 62 0001			Rillenkugellager	Ball bearing	Roulement à billes
27	ZSR 12 0616	M6x16DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
28	ZRG 72 3012	30x1,2 DIN472		Sicherungsring	Circlip	Anneau de retenue
29	ZFD 88 0337	3x3,7 DIN 6888		Scheibenfeder	Woodruff key	Clavette
30	H4A 000 300			Zwischenring	Spacer	Douille d'écartement
31	ZMU 85 1000	M10 DIN 985 -6		Sechskantmutter	Hexagon nut	Ecrou 6 pans
32	ZSR 98 0003	1,47x6,35 TYP LL		Hammerschraube	Screw	Vis
33	ZSR 12 0830	M8x30DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
34	ZSR 33 0625	M6x25DIN933-5.6		Sechskantschraube	Hexagon head screw	Vis hexagonale
35	ZSR 12 1070	M10x70DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
36	ZSR 40 1030	M10x30DIN939-8.8		Stiftschraube	Stud	Goujon
37	ZST 72 0628	6x28DIN1472-6.8		Paßkerbstift	Grooved adjusting pin	Cheville de posit
38	ZST 13 0616	M6x16DIN913-45H		Gewindestift	Set screw	Vis pointeau
39	ZST 51 0816	M8x16DIN551-5.8		Gewindestift	Set screw	Vis pointeau
40	ZSR 12 0816	M8x16DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
41	ZSR 12 0820	M8x20DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
42	ZMU 36 0800	M8 DIN 936-6		Sechskantmutter	Hexagon nut	Ecrou 6 pans
43	ZSB 25 0530	B5,3 DIN 125		Scheibe	Washer	Rondelle
44	ZSR 84 0510	M5x10DIN84-4.8		Zylinderschraube	Flat head screw	Vis tête cylindrique
45	ZFD 85 4412	A4x4x12DIN6885		Paßfeder	Key	Clavette
46	ZSB 25 0640	B6,4 DIN 125		Scheibe	Washer	Rondelle

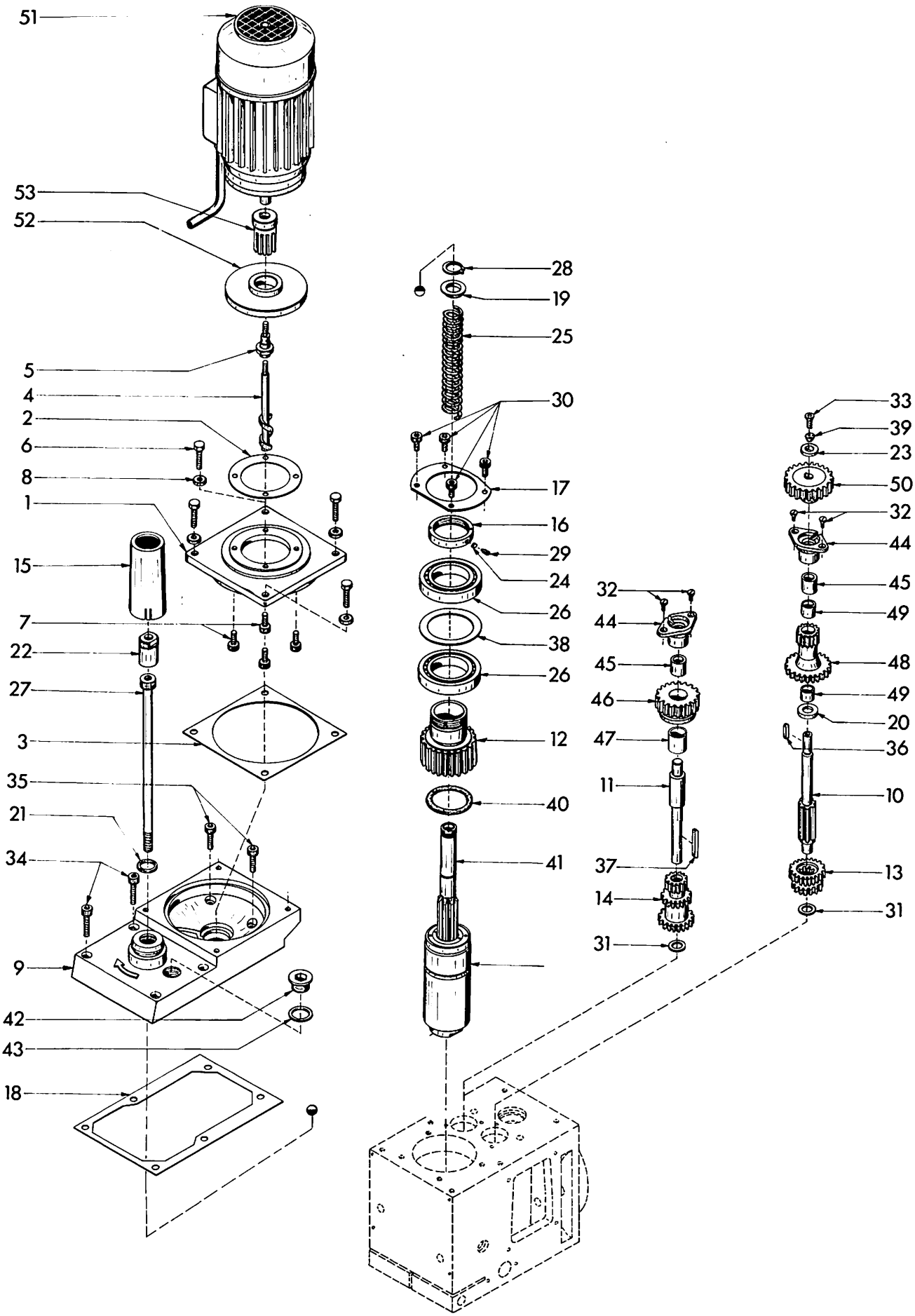
Pos	Ref. Nr.	DIN		Benennung	Description	Designation
47	ZKG 00 1060	6,0 GK3DIN5401		Stahlkugel	Ball	Bille acier
48	ZST 11 0632	6h11x32 DIN 7		Zylinderstift	Dowel pin	Tige de serrage
49	ZNP 01 2000	INA NIP A2		Schmiernippel	Grease nipple	Graisseur
50	ZDK 60 0012			Verschlußstopfen	Stopper	Bouchon
51	F2A 000 270			Positionsschild	Setting mark	Plaque de position
52	F2A 000 240			Skala 1 metr.	Scale 1 metr.	Echelle 1 metr.
	F2B 000 240			Skala 1 USA	Scale 1 USA	Echelle 1 USA
53	F2A 000 250			Skala 2 metr.	Scale 2 metr.	Echelle 2 metr.
	F2B 000 250			Skala 2 USA	Scale 2 USA	Echelle 2 USA
54	F2A 000 230			Frontschild	Front plate	Plaque frontale
55	ZMU 34 1000	M10 DIN 934-6		Sechskantmutter	Hexagon nut	Ecrou 6 pans
56	ZSB 25 1050	B10,5 DIN 125		Scheibe	Washer	Rondelle
57	ZSB 12 1001	10x16x0,1		Paßscheibe	Compensating washer	Rondelle de compensation
	ZSB 12 1002	10x16x0,2		Paßscheibe	Compensating washer	Rondelle de compensation
	ZSB 12 1003	10x16x0,3		Paßscheibe	Compensating washer	Rondelle de compensation
				Gr. E-Ausrüstung	**Electrical equipment compl.**	**Ens. équipment électrique**
58	F2H 100 020			Deckel links franz.	Cover left french	Couvercle à gauche,France
	F2A 100 020			Deckel links	Cover left	Couvercle à gauche
59	F2A 100 030			Deckel rechts	Cover right	Couvercle à droite
60	ZPG 10 0008	MZ B13		Kabelverschraubung	Screw type conduit fitting	Raccordement à vis
61	ZPG 10 0007	MZ B11		Kabelverschraubung	Screwtype conduit fitting	Raccordement à vis
62	ZPG 20 1100	PG 11		Gegenmutter	Lock nut	Contre écrou
63	ZPG 20 1350	PG 13,5		Gegenmutter	Lock nut	Contre écrou
64	ZDK 60 0018			Verschlußstopfen	Stopper	Bouchon
65	ZSR 83 0416	M4x16 DIN84-4.8		Zylinderschraube	Flat head screw	Vis tête cylindrique
66	ZRG 28 0040	B4 DIN 127		Federring	Spring washer	Rondelle à ressort
67	ZMU 34 0401	M4 DIN934 Ms		Sechskantmutter	Hexagon nut	Ecrou 6 pans
68	ZKO ..... *			Kondensator	Condenser	Condensateur
69	ZEL 26 0020			Schalter-Standard (Wechselstrom)	Switch-standard single-phase	Interrupteur stand. monophasé
	ZEL 26 0030			Schalter-Standard (Dreh.)	Switch-standard three-ph.	Interrupteur stand. triphasé
70	ZEL 26 3222			Schalter franz. 380 V	Switch french 380 V	Interrupteur france 380 V
	ZEL 26 1221			Schalter-VDE 220V	Switch-VDE 220V	Interrupteur-VDE 220V
	ZEL 26 3381			Schalter-VDE 380V	Switch-VDE 380V	Interrupteur-VDE 380V
71	F2A 100 040			Dichtung	Seal	Joint d'étanchéité
72	ZSR 89 0510	M5x10DIN7985–4.8		Linsenschraube	Filister head screw	Vis à tête cylindr. bombée
73	ZEL 01 0005	Bk6 KrG		Klemmenleiste	Connection strip	Lardon de serrage
74	ZSR 83 0325	M3x20 DIN84-4.8		Zylinderschraube	Flat head screw	Vis tête cylindrique
75	ZRG 28 0030	B3 DIN 127		Federring	Spring washer	Rondelle à ressort
76	ZMU 34 0300	M3 DIN 934-5		Sechskantmutter	Hexagon nut	Ecrou 6 pans
77	ZDK 60 0004	Kapsto F4		Verschlußstopfen	Stopper	Bouchon
78	F2A 100 010			Erdungsleiste	Grounding connection	Lardon prise de terre
79	ZEL 40 0002			Pilztaster	Push button switch	Interrupteur à bouton poussoir


23
6
33
31
7
13
24
14
30
2
25
26
12
3
15
17
11
17
15
9
5
26
39
36
37
34
35
38
39
26
4
10
21
19
20
22
29
26
40
41
28
27
16
1
8
18

Pos	Ref. Nr.	DIN		Benennung	Description	Designation
				Aufbaumontage	**Assembly**	**Assemblage**
1	E3A 000 031			Vertikalschlitten	Vertical slide	Support poupée coulissant
2	E3A 000 040			Spindelträger	Screw mount	Porte-broche
3	E3A 000 050			Skalenring metr.	Scale ring metr.	Bague echelle metr.
	E3B 000 050			Skalenring USA	Scale ring USA	Bague echelle USA
4	E3A 000 060			Einstellmutter	Adjusting nut	Ecrou reglage
5	E3A 000 070			Druckleiste	Gib	Lardon blocage
6	E3A 000 080			Trägerplatte	Plate	Plaque
7	E3A 000 090			Gradskala	Graduated scale	Echelle
8	E3A 000 100			Nonius	Vernier	Vernier
9	E3A 000 130			Vertikalspindel metr.	Vertical screw metr.	Vis mere metr.
	E3B 000 130			Vertikalspindel USA	Vertical screw USA	Vis mere USA
10	E1A 000 080			Vertikalmutter metr.	Vertical nut metr.	Ecrou metr.
	E1B 000 080			Vertikalmutter USA	Vertical nut USA	Ecrou USA
11	B2A 000 060			Skalenschild metr.	Graduated scale metr.	Echelle metr.
	B2B 000 060			Skalenschild USA	Graduated scale USA	Echelle USA
12	B4A 040 011			Handrad 100	Handwheel	Volant
13	C6A 130 000			Kegelgriff	Handle	Levier spherique
14	B2A 000 080			Bogenfeder	Feed spring	Lame ressort d'entrainement
15	ZLG 60 0002	6000 - 2Z		Rillenkugellager	Ball bearing	Roulement à billes
16	ZSR 87 1040	M10x40 DIN 787		T-Nutschraube	T-nut screw	Boulon en T
17	ZNA 76 0144	1,4x4 DIN1476-4.6		Kerbnagel	Rivet	Rivet de fixation
18	ZSR 14 0256	BM2,5x6 DIN7513		Gewindeschneidschraube	Self tapping screw	Vis taraud
19	ZST 17 0620	M6x20 DIN417-5.8		Gewindestift	Set screw	Vis pointeau
20	ZMU 34 0600	M6 DIN934-6		Sechskantmutter	Hexagon nut	Ecrou 6 pans
21	ZST 11 0528	5h11x28 DIN 7		Zylinderstift	Dowel pin	Tige de serrage
22	ZST 16 0610	M6x10 DIN916-45H		Gewindestift	Set screw	Vis pointeau
23	ZRG 72 6525	65x2,5 DIN 472		Sicherungsring	Circlip	Anneau de retenue
24	ZFD 88 0337	3x3,7 DIN 6888		Scheibenfeder	Circlip	Clavette
25	ZMU 80 0800	NM8 DIN980-8		Sicherungsmutter	Securing nut	Ecrou de sûreté
26	ZSB 25 0840	B8,4 DIN 125		Scheibe	Washer	Rondelle
27	ZSR 84 0525	M5x25 DIN 84-4.8		Zylinderschraube	Flat head screw	Vis tête cylindrique
28	E3A 000 180			Kabelhalter	Cable holder	Support câlde
29	ZSR 33 0812	M8x12 DIN933-5.6		Sechskantschraube	Hexagon head screw	Vis hexagonale
30	ZSR 12 0620	M6x20 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
31	E3A 020 000			Vertikalsäule	Vertical column	Colonne verticale
33	ZSR 84 0512	M5x12 DIN84-4.8		Zylinderschraube	Allen head screw	Vis 6 pans creux
	E3A 040 000			**Gruppe Klemmhebel**	**Clamping lever compl.**	**Ens. levier de serrage**
34	E3A 040 010			Klemmhebel	Clamping lever	Levier de serrage
35	E3A 040 020			Schraube	Screw	Vis
36	E3A 040 030			Druckfeder	Spring	Ressort de compression
37	ZSR 23 0516	M5x16DIN923-5.8		Schraube	Screw	Vis
38	ZSB 25 1050	B10,5 DIN 125		Scheibe	Washer	Rondelle
39	ZSR 31 o87o	M8x7o DIN 931-5.6		Sechskantschraube	Hexagon head screw	Vis hexagonale
4o	ZST o8 o65o	6h8x5o DIN 7		Zylinderstift	Dowel pin	Tige de serrage
41	ZST 13 o81o	M8x1o DIN 913-45H		Gewindestift	Set screw	Vis pointeau


3 19 21 26 37 27 36 35 16 11 36 35 33 3 37 27 40 39 38 41 39 40
22
5
4
1
15
34
14
21
25
17
20
25
17
26
32
21
19
12
4
5
22
20 21 34 46 2 35 24 43 42 44 45 30 13 10 23 29 9 8 28 18 7 6 31

Pos	Ref. Nr.	DIN		BENENNUNG	DESCRIPTION	DESIGNATION
	E3A 010 000			**Gruppe Vertikalkopf**	**Vertical unit compl.**	**Ens.tête de fraisage et perçage**
1	E3A 010 010			Vertikalkopf	Head	Tète de fraisage et perçage
2	E3A 010 090			Lagerbüchse	Bearing bush	Bague de parlier
3	E3A 010 100			Gleitstein	Slider	Crosse
4	E3A 010 130			Dichtung 1	Seal I	Joint d'étanchéité
5	E3A 010 140			Deckel	Cover	Couvercle
6	E3A 010 150			Triebling	Shaft pinion	Pignon arbré
7	E3A 010 160			Skalenring metr.	Graduated ring metr.	Bague graduée metr.
	E3B 010 160			Skalenring USA	Graduated ring USA	Bague graduée USA
8	E3A 010 170			Anschlagring	Stop ring	Butée
9	E3A 010 180			Schenkelfeder	Torsion spring	Ressort de flexion à boudîn
10	E3A 010 190			Triebling halter	Pinion holder	Porte-pignon arbré
11	E3A 010 240			Zentrierring	Centering ring	Bague de centrage
12	E3A 010 250			Gradskala	Graduated scale	Echelle
13	E3A 010 260			Funktionsschild metr.	Function plate metr.	Plague de fonction metr.
	E3B 010 260			Funktionsschild USA	Function plate USA	Plague de fonction USA
14	E3A 010 290			Frontschild	Front palte	Plague frontale
15	E3A 010 310			Anschlagbolzen	Bolt	Tige de butée
16	E3A 010 320			Rohr	Tube	Tube
17	H1A 000 380			Rastenfeder	Spring	Ressort de compression
18	B2A 000 080			Bogenfeder	Feed spring	Lame ressort d'entrainement
19	E3A 016 000			G.Schaltarm	Operating lever compl.	Ens. levier de sélection
20	E3A 017 000			G.Schaltstange	Operating bar	Barre de manceuvre
21	ZOR 00 6020			O-Ring	O-ring	Bague - O
22	ZSR 84 0408	M4x8 DIN 84-4.8		Zylinderschraube	Flat head screw	Vis tête cylindrique
23	ZSR 63 0410	M4x10 DIN963-4.8		Senkschraube	Countersunk screw	Vis tête fraise
24	ZDK 43 1800	DIN 443		Verschlußdeckel 18	Cover	Bouchon de palier
25	ZKG 00 1060	6GK3 DIN5401		Stahlkugel	Ball	Bille acier
26	ZSR 33 0516	M5x16 DIN933-5.6		Sechskantschraube	Hexagon head screw	Vis hexagonale
27	ZSB 99 0700	7 DIN6799		Sicherungsscheibe	Circlip	Rondelle de blocage
28	ZRG 71 2012	W20x1,2 DIN 471		Sicherungsring	Circlip	Anneau de retenue
29	ZHL 81 0412	4x12 DIN1481		Spannhülse	Lock pin	Goupille serrage
30	ZHL 81 0416	4x16 DIN 1481		Spannhülse	Lock pin	Goupille serrage
31	ZSR 12 0416	M4x16 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
32	ZNA 76 0144	1,4x4 DIN1476-4.6		Kerbnagel	Rivet	Rivet de fixation
33	ZDK 80 3800			Ölstandsauge R3/8	Oil level gauge	Voyant d'huile
34	ZSR 14 0266	BM2,6x6 DIN7513		Gewindeschneidschraube	Self tapping screw	Vis taraud
35	ZSB 25 1050	B10,5 DIN 125		Scheibe	Washer	Rondelle
36	ZMU 34 1000	M10 DIN934-6		Sechskantmutter	Hexagon nut	Ecrou 6 pans
37	ZSB 12 1001	10x16x0,1 DIN988		Paßscheibe	Washer	Rondelle
	ZSB 12 1003	10x16x0,3 DIN988		Paßscheibe	Washer	Rondelle
	E3A 030 000			**Gruppe Stecknabe**	**Hub compl.**	**Ens. moyeu**
38	E3A 030 010			Stecknabe	Hub	Moyeu
39	E3A 030 020			Knebel	Toggle	Garrot
40	ZGF 39 2508	25xM8 GN419		Konusknopf	Cone knob	Bouton conique
41	ZSR 12 0416	M4x16 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
	E3A 040 000			**Gruppe Klemmhebel**	**Clamping lever compl.**	**Ens. Levier de serragé**
42	E3A 040 010			Klemmhebel	Clamping lever	Levier de serragé
43	E3A 040 020			Schraube	Screw	Vis
44	E3A 040 030			Druckfeder	Spring	Ressort de compression
45	ZSR 23 0516	M5x16 DIN923-5.8		Schraube	Screw	Vis
46	E3A 100 020			Drehzahlschild 50Hz	Speed plate 50Hz	Plaquette de vitesses 50 Hz
	E3B 100 020			Drehzahlschild 60Hz	Speed plate 60Hz	Plaquette de vitesses 60 Hz


51
53
52
5
4
2
6
8
1
15
7
22
27
3
35
21
34
9
42
43
18
28
19
25
30
17
16
29
24
26
38
26
12
40
41
32
44
45
46
47
11
37
14
31
33
39
23
50
32
44
45
49
48
49
20
36
10
13
31

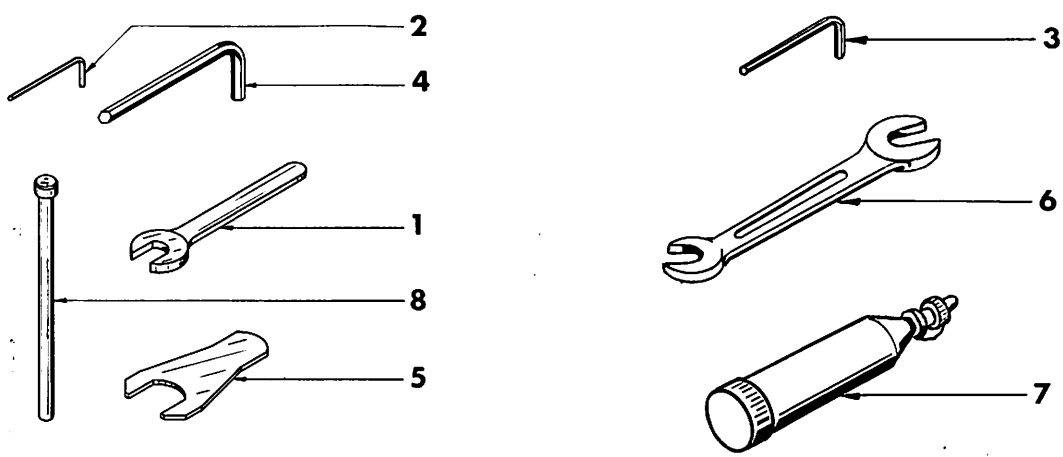
Pos.	Ref. No.	DIN		Benennung	Description	Designation
1	E3A ooo o2o			Motorflansch	Flange	Fausse bride
2	E3A ooo 11o			Dichtung 2	Seal 2	Joint d'étanchéité 2
3	E3A ooo 12o			Dichtung 4	Seal 4	Joint d'étanchéité 4
4	E3A ooo 14o			Förderschnecke	Worm	Vis sans fin
5	E3A ooo 15o			Adapter	Adaptor	Adapteur
6	ZSR 33 o62o	M6x2o DIN933-5.6		Sechskantschraube	Hexagonal head screw	Vis hexagonale
7	ZSR 12 o512	M5x12 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
8	ZSB 25 o64o	B6,4 DIN 125		Scheibe	Washer	Rondelle
9	E3A o1o o2o			Getriebedeckel	Gearing cover	Couvercle
1o	E3A o1o o3o			Schiebewelle	Spline shaft	Abre rainure
11	E3A o1o o4o			Schaltwelle	Control shaft	Abre de débrayage
12	E3A o1o o5o			Zahnrad 42	Gear 42	Elément dentè 42
13	E3A o1o o6o			Schiebezahnrad	Sliding gear	Train baladeur
14	E3A o1o o7o			Zahnradblock	Gear bank	Bloc baladeur
15	E3A o1o o8o			Schutzhaube	Cover	Couvercle
16	E3A o1o 11o	M45x1		Mutter	Nut	Ecrou
17	E3A o1o 12o			Spanndeckel	Cover	Couvercle
18	E3A o1o 22o			Dichtung 3	Seal 3	Joint d'étanchéité 3
19	E3A o1o 23o			Druckscheibe	Pressure washer	Disque de pression
2o	E3A o1o 27o			Anlaufscheibe	Washer	Rondelle
21	ZOR 8o 1824	G18x24x3		Dichtring	Sealing ring	Bague d'étanchéité
22	E3A o1o 3oo			Abdrückmutter	Nut	Ecrou
23	E3A o1o 33o			Scheibe	Washer	Rondelle
24	B2A o3o o6o			Druckscheibe	Disc	Rondelle pointeau
25	E3A o1o 34o			Druckfeder	Spring	Ressort de compression
26	ZLG 16 oo93	16oo9/C3		Rillenkugellager	Ball bearing	Roulement à billes
27	ZSR 13 12oo	M1ox2oo DIN912-1o.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
28	ZRG 71 1812	W18x1,2 DIN 471		Sicherungsring	Circlip	Anneau de retenue
29	ZST 17 o4o5	M4x5 DIN417-5.8		Gewindestift	Set screw	Vis pointeau
3o	ZSR 12 o61o	M6x1o DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
31	ZSB 1o 2181	SS12x18x1,2 DIN988		Seeger Stützscheibe	Washer	Rondelle
32	ZSR 63 o41o	M4x1o DIN963-4.8		Senkschraube	Countersunk screw	Vis tête fraisée
33	ZSR 79 o412	M4x12 DIN7991-8.8		Senkschraube	Countersunk screw	Vis tête fraisée
34	ZSR 12 o625	M6x25 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
35	ZSR 12 o62o	M6x2o DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
36	ZFD 85 332o	A3x3x2o DIN6885		Paßfeder	Key	Clavette
37	ZFD 85 4432	A4x4x32 DIN6885		Paßfeder	Key	Clavette
38	ZSB 12 6oo5	PS6ox75xo,5		Seeger Paßscheibe	Washer	Rondelle
39	ZSB 98 o432	V4,3 DIN 6798		Fächerscheibe	Serrated lock washer	Rondelle
4o	ZOR o4 6o31	OR 46-3		O-Ring	O-ring	Bague-O
41	E3A o11 ooo			Gr. Pinole	Quill compl.	Ens. canon
42	ZSR o8 1415	M14x1,5 DIN9o8-4.6		Verschlußschraube	Screw plug	Bouchon filetè
43	ZRG o5 1418	14x18x1,5cuDIN76o3		Dichtring	Sealing ring	Bague d'étanchéité
44-45	E3A o12 ooo			Gr. Lagerdeckel	Bearing cover compl.	Ens. chapeau de palier
44	E3A o12 o1o			Lagerdeckel	Bearing cover	Chapeau de palier
45	E3A o1o o9o			Lagerbüchse	Bearing bush	Bague de palier
46-47	E3A o13 ooo			Gr. Zahnrad 33	Gear 33 compl.	Ens. engrenage 33 dents
46	E3A o13 o1o			Zahnrad 33	Gear 33	Engrenage 33
47	E3A o13 o2o			Lagerbüchse	Bearing bush	Bague de palier
48-49	E3A o14 ooo			Gr. Zahnrad	Gear compl.	Ens. engrenage
48	E3A o14 o1o			Zahnrad	Gear	Engrenage
49	E3A o14 o2o			Lagerbüchse	Bearing bush	Bague de palier
5o	E3A o15 ooo			Zahnrad 47	Gear 47	Engrenage 47

Pos.	Ref. Nr.	DIN		BENENNUNG	DESCRIPTION	DESIGNATION
				Gruppe E-Ausrüstung	**Drive unit**	**Ens. Entrainement**
51	ZMO . . . . . *			Motor	Motor	Moteur
52+53	E3A 101 000			Schwungscheibe	Flywheel	Disque volant
53	E3A 101 020			Motorritzel	Motor pinion	Pignon

* Ref. Nr. siehe Tabelle Seite 13

* Ref. Nr. see table page 13

* Ref. Nr. voir tableau page 13



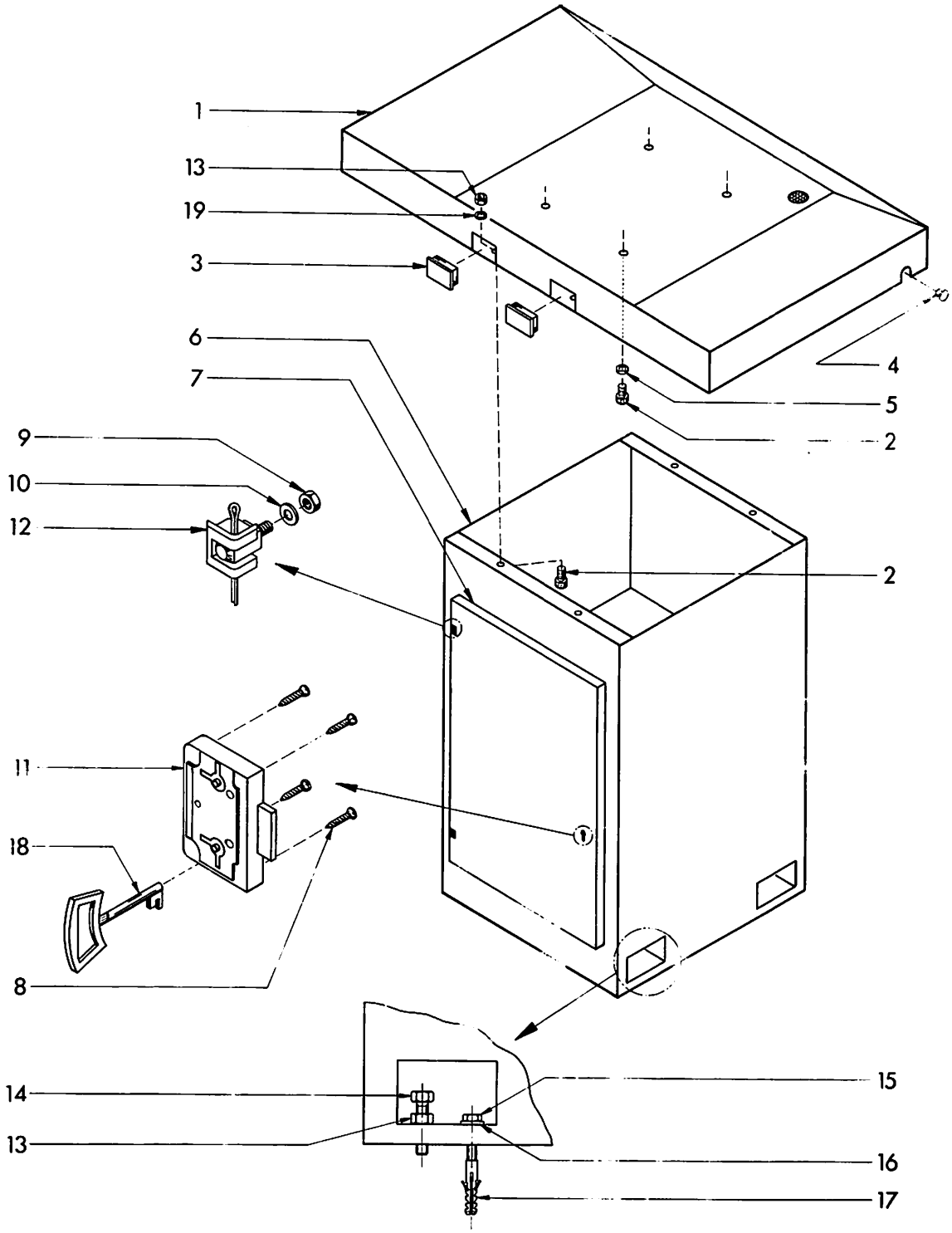
Pos.	Ref. No.	DIN		Benennung	Description	Designation
				Grundausstattung	**Tools**	**Equipment de base**
1	ZWZ 94 1700	SW 17 DIN 894		Einmaulschlüssel	Single-ended spanner	Clé deservice
2	ZWZ 11 0300	SW 3 DIN 911		Schraubendreher	Hexagonal key	Clé à six pans
3	ZWZ 11 0600	SW 6 DIN 911		Schraubendreher	Hexagonal key	Clé à six pans
4	ZWZ 11 0800	SW 8 DIN 911		Schraubendreher	Hexagonal key	Clé à six pans
5	E1A 000 320			Schlüssel	Key wrench	Clé
6	ZWZ 95 1310	13x10 DIN 895		Doppelmaulschlüssel	Open-ended spanner	Clé plate simple
7	ZWZ 99 0012	12 K		Fettpresse	Grease gun	Petite pompe à graisse
8	E3A 000 170			Abdrückstange	Rod	Vis de dégagement

Wechselstromausführung
Single phase equipment
Equipment monophase

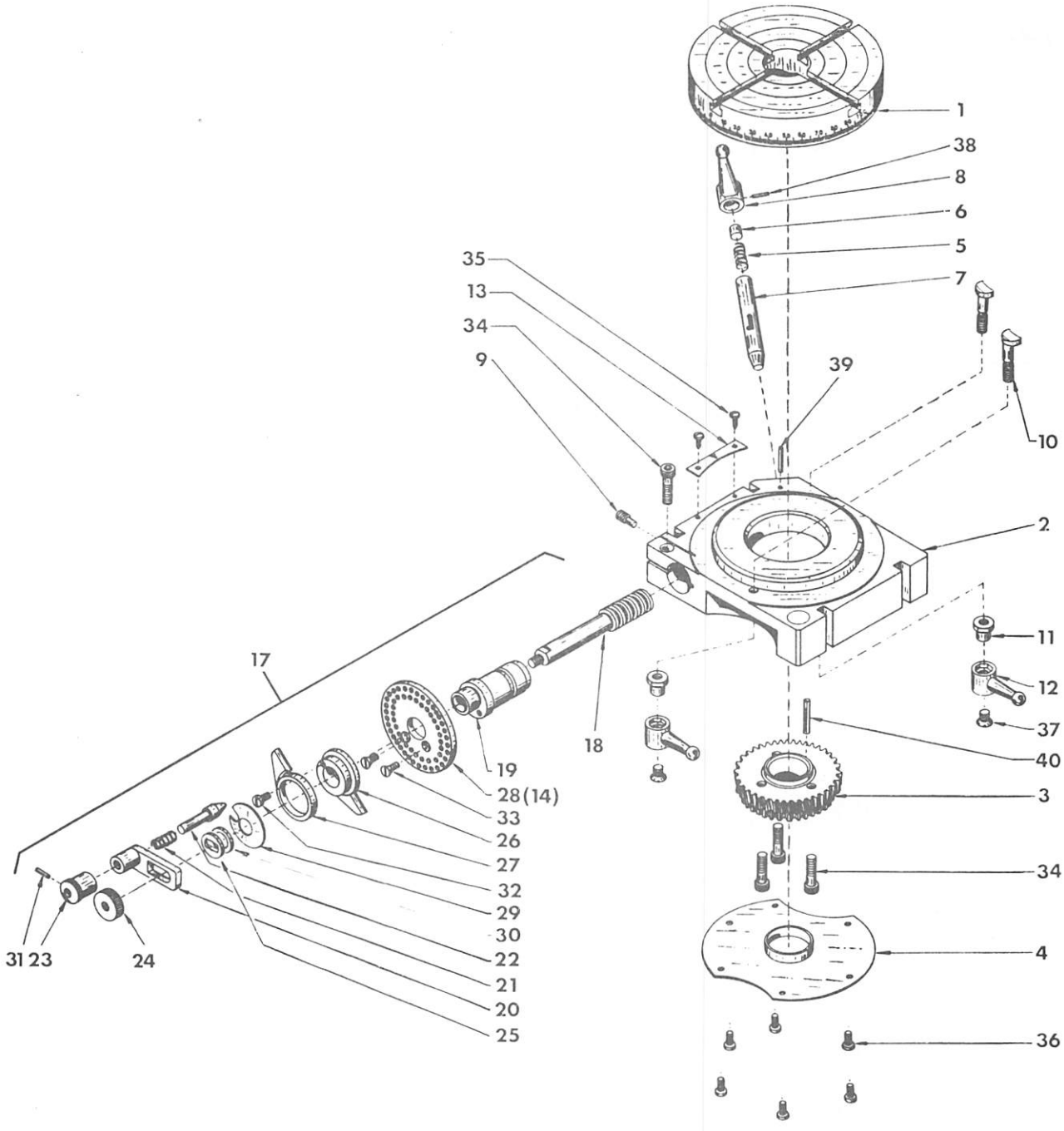
Spannung Voltage (V) Tension	Frequenz Frequency Frequence	Ref. Nr. für Kondensator Ref. Nr. for condenser Ref. Nr. condensateur	Ref. Nr. für Motor Ref. Nr. for motor Ref. Nr. moteur
220	60	ZKO 15 4208	ZMO 56 1220
115	60	ZKO 15 2430	ZMO 56 1115
100	60	ZKO 15 2540	ZMO 56 1100
250	50	ZKO 15 4606	ZMO 55 1250
240	50	ZKO 15 4606	ZMO 55 1240
230	50	ZKO 15 4208	ZMO 55 1230
220	50	ZKO 15 4208	ZMO 55 1220
110	50	ZKO 15 2430	ZMO 55 1110
100	50	ZKO 15 2540	ZMO 55 1100

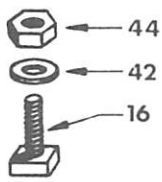
Drehstromausführung
Three phase equipment
Equipment triphase

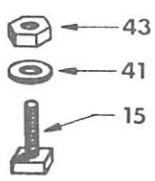
Spannung Voltage (v) Tension	Frequenz Frequency Frequence	Ref. Nr für Motor Ref. N. for motor Ref. Nr. moteur
440	60	ZMO 56 3440
220	60	ZMO 56 3220
500	50	ZMO 55 3500
350	50	ZMO 55 3350
440	50	ZMO 55 3440
380	50	ZMO 55 3380
220	50	ZMO 55 3220


1
13
19
3
6
7
9
10
12
11
18
8
14
13
15
16
17
4
5
2
2

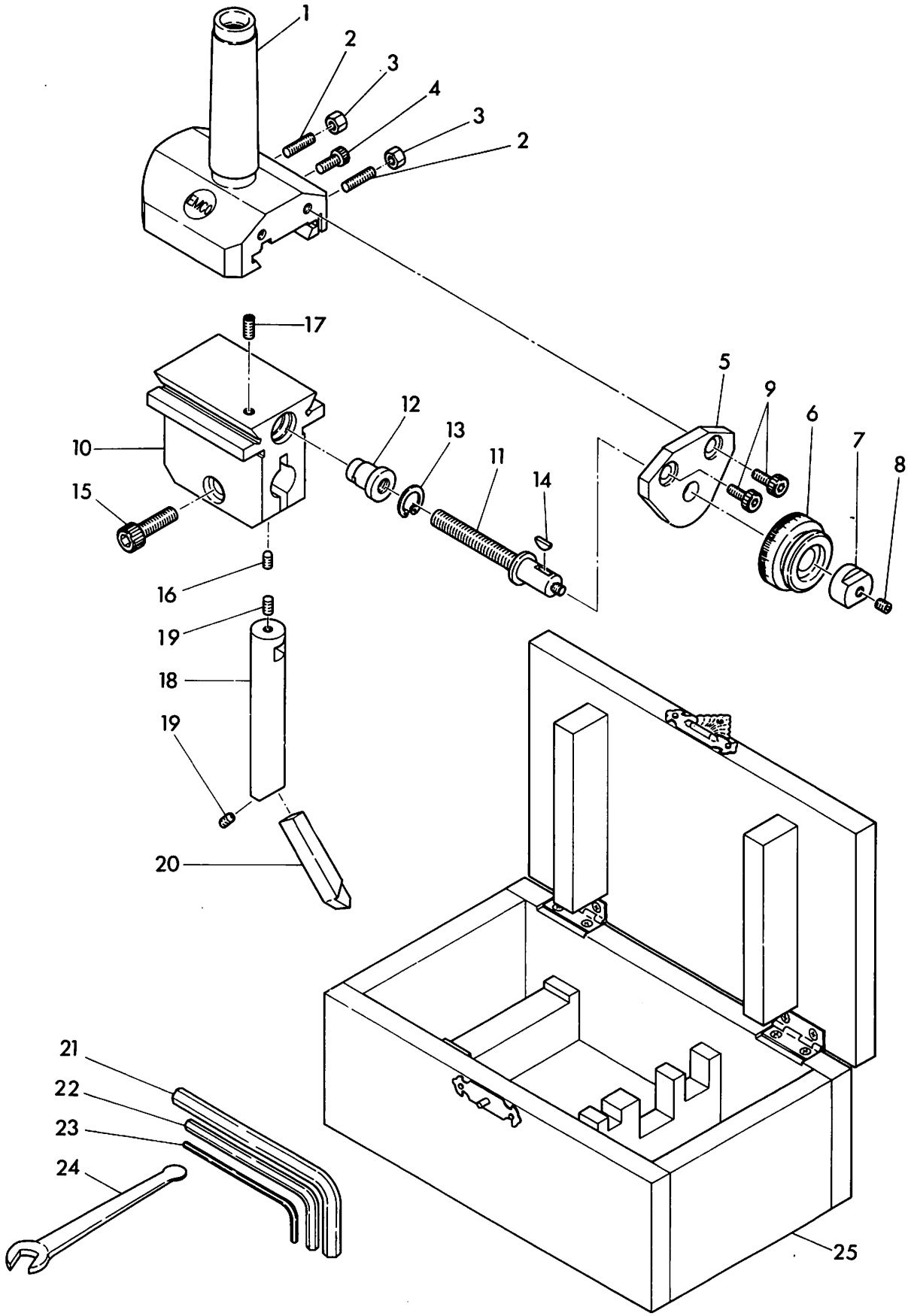
Pos.	Ref. No.	DIN		Benennung	Description	Designation
	76o o3o			Spänewanne	Chip tray	Bac à copeaux
1	F2Z 211 ooo			Spanwanne	Chip tray	Bac à copeaux
2	ZSR 12 1o2o	M1ox2o DIN912-8.8		Zylinderschraube	Socket head screw	Vis 6 pans creux
3	ZDK 7o ooo1	6ox4ox3		Lamellenstopfen	Plug	Bouchon fileté
4	ZDK 6o oo1o	F1o		Verschlußstopfen	Plug	Bouchon fileté
5	ZSB 64 o3o5	M1o		Schraubensicherung	Lockwasher	Rondelle
	76o 22o			Maschinenuntersatz	Machine stand	Socle-machine
6	F2Z 221 ooo			Maschinenuntersatz	Machine stand	Socle machine
7	F2Z 223 ooo			Tür	Door	Porte
8	ZSR 72 2916	B2,9x16 DIN7972		Blechschraube	Sheet metal screw	Vis en tôle
9	ZMU 34 o5oo	M5 DIN934-5		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
1o	ZSB 25 o53o	B5,3 DIN125		Scheibe	Washer	Rondelle
11	ZXM o2 2ooo			Anschlagschloß	Lock	Serrure
12	ZXM 3o ooo1			Scharnier	Frame joint	Charnière
13	ZMU 34 1ooo	M1o DIN934-6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
14	ZSR 33 1o45	M1ox45 DIN933		Sechskantschraube	Hexagon head screw	Vis hexagonale
15	ZSR 57 o87o	8x7o DIN571-4.6		Holzschraube	Hexagon wood screw	Vis à bois
16	ZSB 25 o84o	B8,4 DIN125		Scheibe	Washer	Rondelle
17	ZDK 1o 1ooo	S1o		Dübel	Plug	Cheville
18	ZME o9 ooo7			Schlüssel	Key	Clé
19	ZSB 25 1o5o	B1o,5 DIN125		Scheibe	Washer	Rondelle


1
38
8
6
5
7
35
13
34
9
39
10
2
11
12
37
40
3
34
4
36
17
18
19
28(14)
33
26
27
32
29
30
22
21
20
25
31
23
24

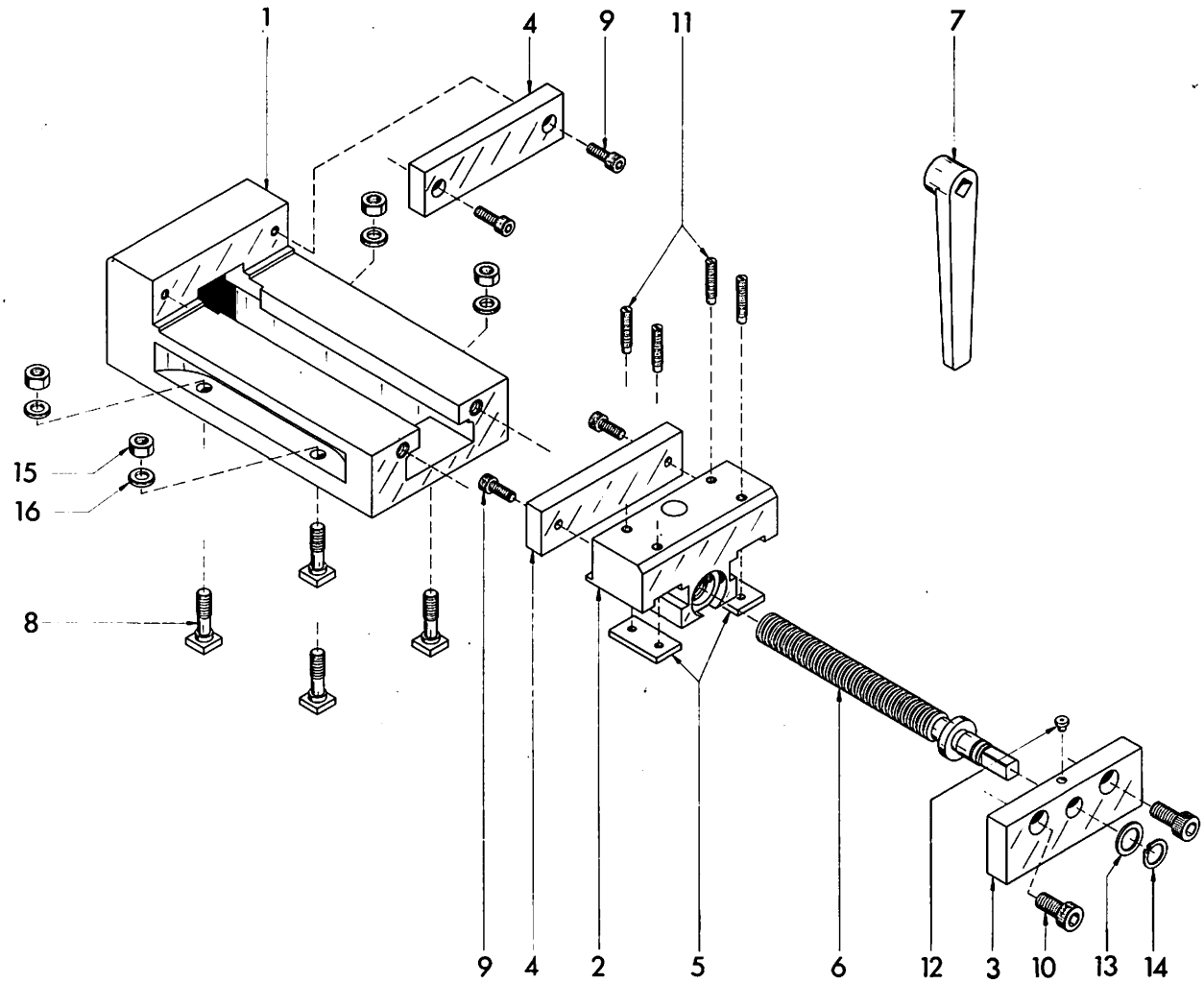

44
42
16


43
41
15

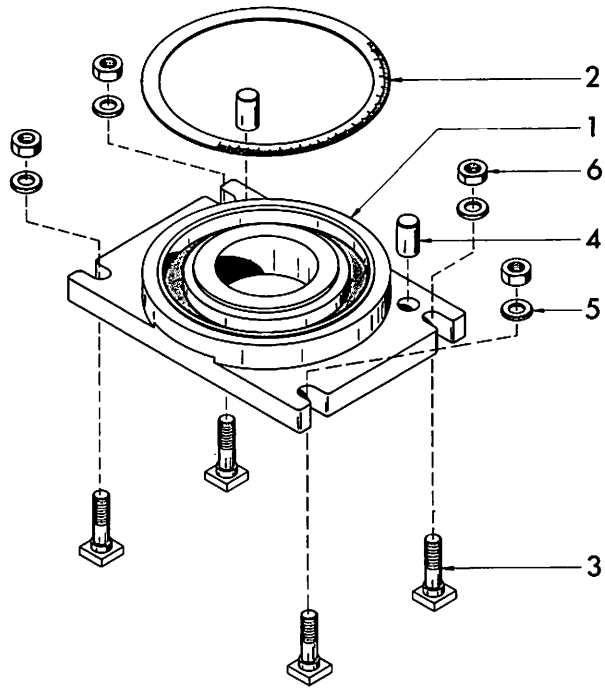
	745 000			G. Teilapparat	Dividing head	Appareil diviseur
Pos	Ref. No.	DIN		BENENNUNG	DESCRIPTION	DESIGNATION
1	B2Z 320 010			Rundtisch	Table	Table
2	B2Z 320 020			Gehäuse	Housing	Corps
3	B2Z 320 030			Teilrad	Table flange	Broche diviseur
4	B2Z 320 040			Deckblech	Cover mount	Couvercle
5	B2Z 320 050			Druckfeder	Compression spring	Ressort à pression
6	B2Z 320 060			Druckbolzen	Bolt	Boulon
7	B2Z 320 070			Index	Locking pin	Index
8	B2Z 320 080			Knebelgriff	Lever	Levier
9	B2Z 320 090			Anschlagschraube	Bushing	Douille
10	B2Z 320 100			Klemmschraube	Locking bolt	Vis de blocage
11	B2Z 320 110			Mutter	Nut	Ecrou
12	B2Z 320 120			Knebelgriff	Lever	Levier
13	B2Z 320 130			Zeiger	Guide	Indicateur
14	B2Z 320 140			Lochscheibe 33-36-39	Indexing plate	Disque à trous
	B2Z 320 150			Lochscheibe 38-40	Indexing plate	Disque à trous
15	B2Z 320 160	M 6		Nutenschraube	T-Nut	Glissière
16	B2Z 320 170	M 8		Nutenschraube	T-Nut	Glissière
17	B2Z 321 000			Gr. Schnecke	Worm shaft	Vis sans fin
18	B2Z 321 010			Schnecke	Worm shaft	Vis sans fin
19	B2Z 321 020			Exzenter	Assembly arbor	Excentrique
20	B2Z 321 030			Kurbel	Crank	Manivelle
21	B2Z 321 040			Druckfeder	Compression spring	Ressort à pression
22	B2Z 321 050			Absteckbolzen	Bolt	Boulon
23	B2Z 321 060			Hülse	Sleeve	Gousse
24	B2Z 321 070			Rändelmutter	Knurled nut	Ecrou moletée
25	B2Z 321 080			Scheibe	Plate	Poulie
26	B2Z 321 090			Schere rechts	Section arm r. h.	Lyre droite
27	B2Z 321 100			Schere links	Section arm l. h.	Lyre gauche
28	B2Z 321 120			Lochscheibe 27-36-42	Indexing plate	Disque à trous
29	B2Z 321 130			Tellerfeder	Spring washer	Ressort hélicoidal
30	B2Z 321 140			Scheibe 1,8	Plate 1,8	Poulie 1,8
	B2Z 321 150			Scheibe 2,0	Plate 2,0	Poulie 2,0
	B2Z 321 160			Scheibe 2,2	Plate 2,2	Poulie 2,2
31	ZHL 81 0212	2x12 DIN 1481		Spannhülse	Pin	Tige de serrage
32	ZSR 85 0406	AM4x6 DIN 85		Zylinderschraube	Flat head screw	Vis cylindriques
33	ZSR 63 0410	M4x10 DIN 963		Senkschraube	Flat head screw	Vis de sûreteé
34	ZSR 12 0625	M6x25 DIN 912		Innensechskantschraube	Allen head screw	Vis six pans creux
35	ZSR 84 0304	M3x4 DIN 84		Zylinderschraube	Flat head screw	Vis cylindriques
36	ZSR 84 0406	M4x6 DIN 84		Zylinderschraube	Flat head screw	Vis cylindriques
37	ZSR 63 0608	M6x8 DIN 963		Senkschraube	Flat head screw	Vis de sûreteé
38	ZHL 81 0214	2x14 DIN 1481		Spannhülse	Pin	Tige de serrage
39	ZHL 81 0322	3x22 DIN 1481		Spannhülse	Pin	Tige de serrage
40	ZHL 81 0530	5x30 DIN 1481		Spannhülse	Pin	Tige de serrage
41	ZSB 25 0640	B6,4 DIN 125		Scheibe	Washer	Rondelle
42	ZSB 25 0840	B8,4 DIN 125		Scheibe	Plate	Poulie
43	ZMU 34 0600	M6 DIN 934		Mutter	Nut	Ecrou
44	ZMU 34 0800	M8 DIN 934		Mutter	Nut	Ecrou


1
2
3
4
3
2
17
5
9
6
7
8
12
13
11
14
10
15
16
19
18
19
20
21
22
23
24
25

Pos.	Ref. Nr.	DIN		Benennung	Description	Designation
	525 330			**Ausdrehkopf**	**Boring head**	**Tête d'alésage**
1	ZME 11 3000			Ausdrehkopf	Boring head	Tête d'alésage
2	ZME 11 3010	M4x12 DIN 916		Gewindestift	Set screw	Vis pointeau
3	ZMU 34 0400	M4 DIN 934		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
4	ZSR 12 0410	M4x8 DIN 912		Zylinderschraube	Socket head screw	Vis 6 pans creux
5	ZME 11 3001			Spindelträger	Bracket	Porte-broche
6	ZME 11 3002			Skalenring	Micrometer collar	Bague échelle
7	ZME 11 3003			Mutter	Round nut	Ecrou
8	ZME 11 3011	M4x8 DIN 916		Gewindestift	Set screw	Vis pointeau
9	ZSR 12 0410	M4x8 DIN 912		Zylinderschraube	Socket head screw	Vis 6 pans creux
10	ZME 11 3004			Schlitten	Slide	Chariot
11	ZME 11 3005			Spindel	Feed screw	Vis filetée
12	ZME 11 3006			Mutter	Feed nut	Ecrou
13	ZME 11 3012			Sicherungsring	Snap ring	Anneau de retenue
14	ZME 11 3013	DIN 6888		Scheibenfeder	Key	Clavette à disque
15	ZSR 12 0618	M6x16 DIN 912		Zylinderschraube	Socket head screw	Vis 6 pans creux
16	ZME 11 3014	M4x6 DIN 916		Gewindestift	Set screw	Vis pointeau
17	ZME 11 3011	M4x8 DIN 916		Gewindestift	Set screw	Vis pointeau
18	ZME 11 3007			Stahlhalter	Boring bar	Porte-outil
19	ZME 11 3014	M4x4 DIN 916		Gewindestift	Set screw	Vis pointeau
20	ZME 11 3015	6x6x40		Ausdrehstahl	Boring bit	Outil d'alésage
21	ZWZ 11 0500	SW 5 DIN 911		Schraubendreher	Allen key wrench 5 mm	Clé à écrous
22	ZWZ 11 0300	SW 3 DIN 911		Schraubendreher	Allen key wrench 3 mm	Clé à écrous
23	ZWZ 11 3016	SW 2 DIN 911		Schraubendreher	Allen key wrench 2 mm	Clé à écrous
24	ZME 11 3008			Einmaulschlüssel	Spanner 7 mm	Clé de service
25	ZME 11 3009			Holzkassette	Wooden box	Boîte en bois



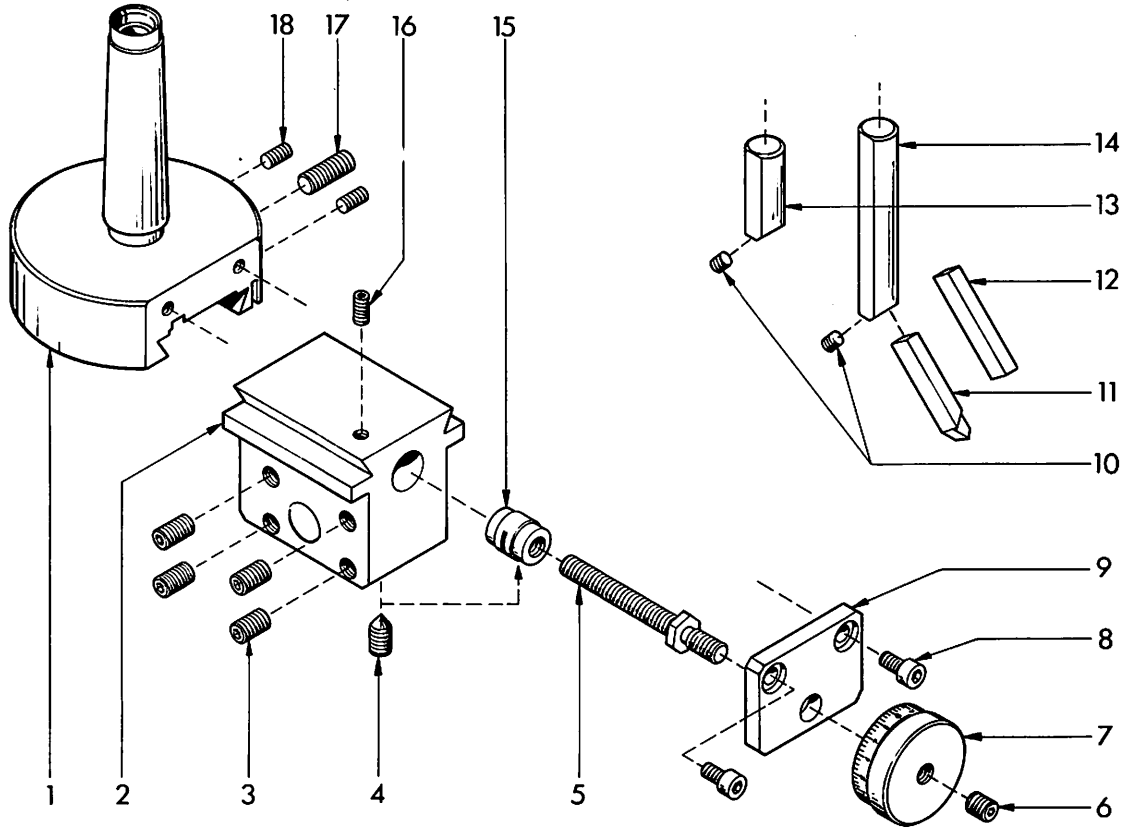
Pos.	Ref. Nr.	DIN		Benennung	Description	Designation
	761 310			**Gruppe Maschinen-schraubstock**	**Vice compl.**	**Ens. Etau-machine**
1	F2Z 310 010			Körper	Body	Corps
2	F2Z 310 020			Backe	Moving jaw	Mors mobile
3	F2Z 310 030			Spindelträger	Screw mount	Porte - broche
4	F2Z 310 040			Einsatz	Jaw	Garniture de mors
5	F2Z 310 050			Druckleiste	Plate	Plaquette
6	F2Z 310 060			Spindel	Operating screw	Broche
7	B2Z 310 080	SW 10		Schlüssel	Key wrench	Clé
8	C4Z 030 020			Nutenschraube	T-Bolt	Boulon-T
9	ZSR 12 0616	M6x16 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
10	ZSR 12 1020	M10x20 DIN912-8.8		Zylinderschraube	Allen head screw	Vis 6 pans creux
11	ZST 17 0625	M6x25 DIN417-5.8		Gewindestift	Set screw	Vis pointeau
12	ZNP 01 2000			Schmiernippel	Grease fitting	Graisseur
13	ZSB 10 4201	14x20x1,5		Stützscheibe	Washer	Rondelle
14	ZRG 71 1410	W14x1 DIN 471		Sicherungsring	Circlip	Anneau de retenue
15	ZMU 34 0800	M8 DIN 934-6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans
16	ZSB 25 0840	B8,4 DIN 125		Scheibe	Washer	Rondelle



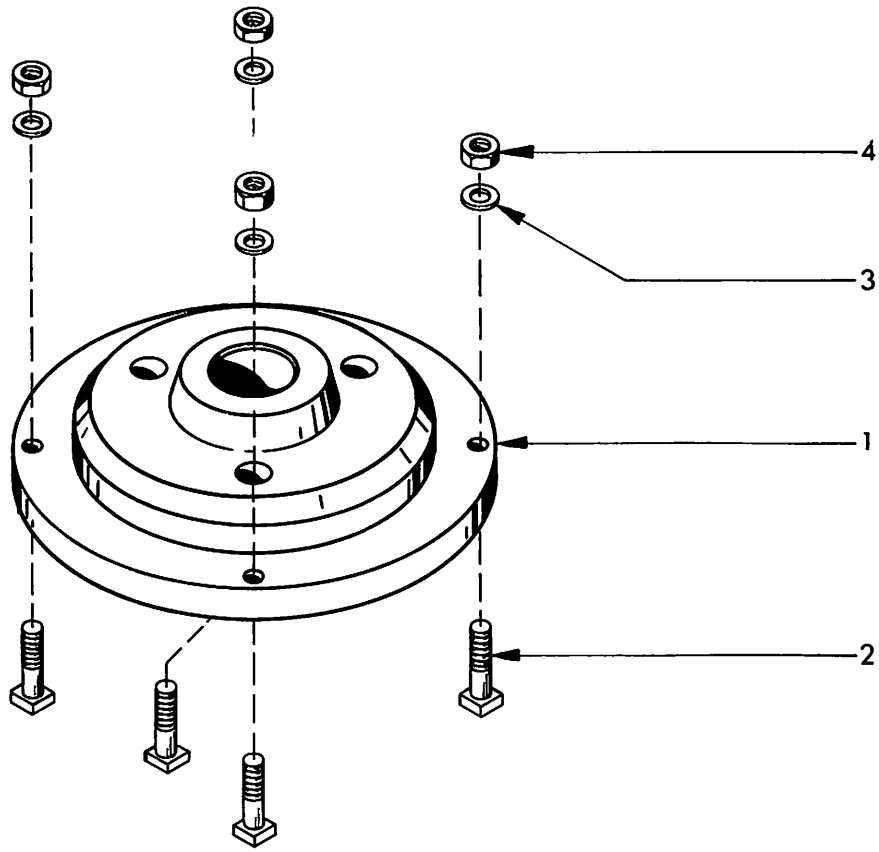
Pos.	Ref. Nr.	DIN		Benennung	Description	Designation
	761 320			**Gruppe Untersatz**	**Swivel base compl.**	**Ens. Base rotative**
1	F2Z 320 010			Untersatz	Base plate	Embase
2	F2Z 320 020			Skalenschild	Scale plate	Bande rèpere graduée
3	C4Z 030 020			Nutenschraube	T-Bolt	Boulon-T
4	C4Z 030 030			Nutenstift	Guide	Douille - guide
5	ZSB 25 0840	B8,4 DIN 125		Scheibe	Washer	Rondelle
6	ZMU 34 0800	M8 DIN 934-6		Sechskantmutter	Hexagon nut	Ecrou 6 pans

Ausdrehkopf Boring head Tête d'alésage

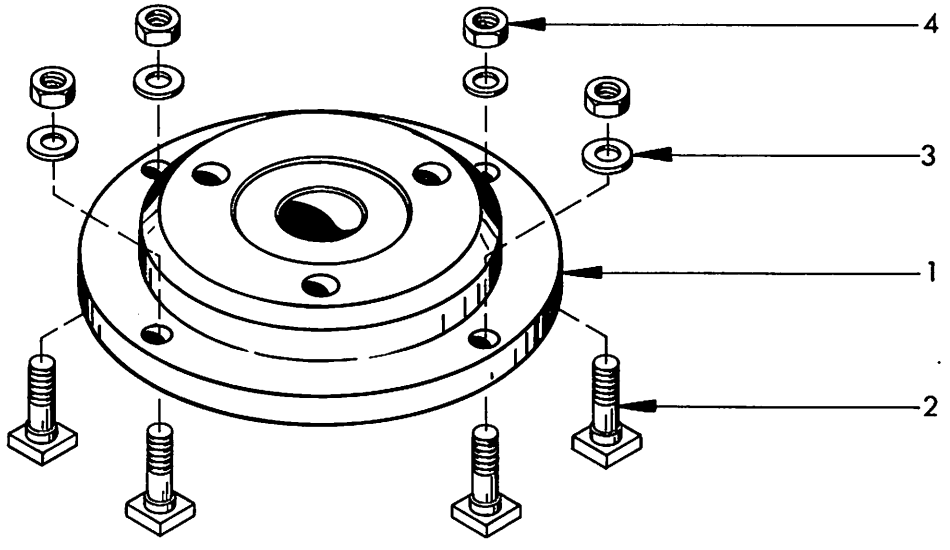
(Ref. Nr. 524 030)



Pos.	Ref. No.	DIN		Benennung	Description	Designation
1	E3Z o3o o1o			Ausdrehkopf	Boring head	Tête d'alésage
2	E3Z o3o o4o			Schlitten	Slide	Chariot
3	ZST 13 o61o	M6x1o DIN 913		Gewindestift	Set screw	Vis pointeau
4	ZST 14 o6o8	M6x8 DIN 914		Gewindestift	Set screw	Vis pointeau
5	E3Z o3o o5o			Spindel	Feed screw	Vis filetée
6	ZST 13 o6o6	M6x6 DIN 913		Gewindestift	Set screw	Vis pointeau
7	E3Z o3o o3o			Skalenring	Micrometer collar	Bague d'echelle
8	ZSR 12 o4o8	M4x8 DIN 912-6.9		Zylinderschraube	Socket head screw	Vis 6 pans creux
9	E3Z o3o o2o			Spindelträger	Bracket	Porte-broche
10	ZST 16 o4o4	M4x4 DIN 916		Gewindestift	Set screw	Vis pointeau
11	A3Z 1oo o3o			Plandrehstahl	Boring bit	Outil d'alésage
12	A3Z 1oo o2o			Drehstahl Rohling	Unground bit	Acier brute
13	E3Z o3o o8o			Stahlhalter	Boring bar	Porte-outil
14	E3Z o3o o7o			Stahlhalter	Boring bar	Porte-outil
15	E3Z o3o o6o			Mutter	Nut	Ecrou
16	ZST 13 o4o8	M4x8 DIN 913		Gewindestift	Set screw	Vis pointeau
17	ZST 14 o616	M6x16 DIN 914		Gewindestift	Set screw	Vis pointeau
18	ZST 14 o4o8	M4x8 DIN 914		Gewindestift	Set screw	Vis pointeau
19	ZWZ 11 o2oo	SW2 DIN 911		Schraubendreher	Allen key wrench	Clé à écrous
20	ZWZ 11 o3oo	SW3 DIN 911		Schraubendreher	Allen key wrench	Clé à écrous
21	ZWZ 11 o5oo	SW5 DIN 911		Schraubendreher	Allen key wrench	Clé à écrous



Pos.	Ref. No.	DIN		Benennung	Description	Désignation
	584 170			**G. Zwischenflnasch**	**Adaptor plate compl.**	**Ens. Flasque intermédiaire**
1				Zwischenflansch	Adaptor plate	Flasque intermédiaire
2	B4Z 170 020	M6		Nutenschraube	T–bolt	Boulon–T
3	ZSB 25 0640	B6,4 DIN 125		Scheibe	Washer	Rondelle
4	ZMU 34 0600	M6 DIN 934–6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans



Pos.	Ref. No.	DIN		Benennung	Description	Désignation
	584 250			**G. Supportflansch**	**Support backplate compl.**	**Ens. Flasque support**
1				Supportflansch	Support backplate	Flasque support
2	C4Z 030 020			Nutenschraube	T–bolt	Boulon–T
3	ZSB 25 0840	B8,4 DIN 125		Scheibe	Washer	Rondelle
4	ZMU 34 0800	M8 DIN 934–6		Sechskantmutter	Hexagonal nut	Ecrou 6 pans

THE AUTOMATIC FEED UNIT

TECHNICAL DATA:

Number of feeds	3
Feed speeds	33/65/17o mm/min 1.3/2.5/6.7 inch/min
Gear lubrication	Grease (greased for life)
Weight	approx. 8 kg

Electrical equipment:

IEC-standardized motor, dust- and splashproof according to IP54

Motor capacity (1-phase and 3-phase)	o,o5 kW

Cable with steel jacket

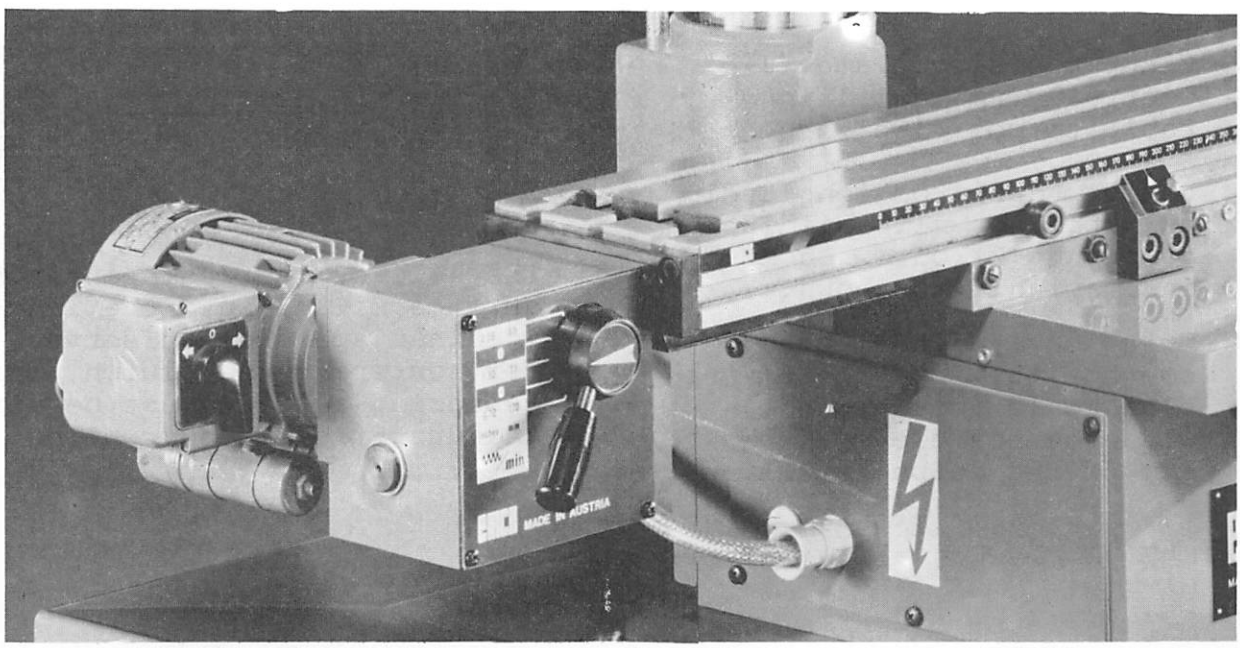
General Description:

The worm gear and 3-step sliding gears are built into the cast iron housing. Drive is achieved by the IEC-standardized flange motor.

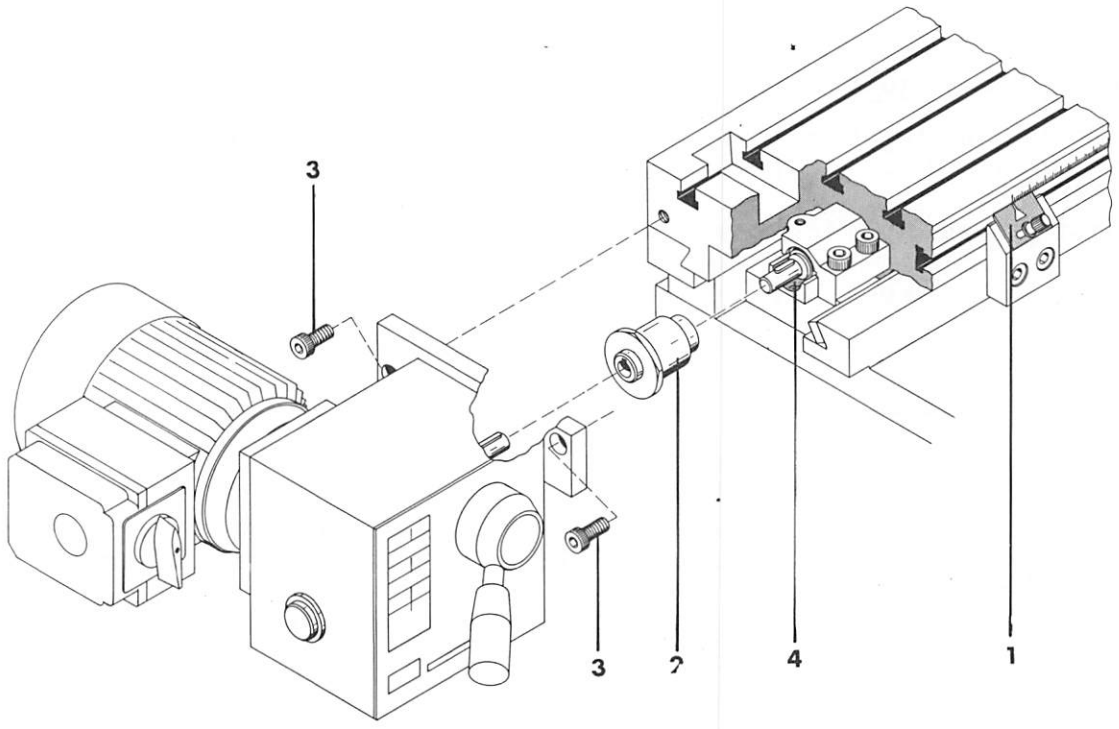
The driven end of the shaft moves via the sliding coupling the longitudinal spindle which affects the travel of the milling table.
The feed directions are chosen with the motor switch (to the left or to the right).

Function of the sliding clutch

1. Guard against overload of machine and tools.
2. In connection with the 2 stop bolts, it enables milling to a dead length with high duplicating accuracy.
3. The unintentional contact of the tool with the clamping devices can be avoided with the stop bolts.



MOUNTING THE AUTOMATIC FEED UNIT



1. Clamp position plate (1) centrally, move milling table to position zero.

2. Remove tape from longitudinal spindle, slip sliding coupling (2) onto longitudinal spindle as shown.

3. Turn longitudinal spindle so that the position of the clutch slot corresponds with the position of the key of the output shaft.

Attention:

Threaded holes of the milling table and the contact surfaces milling table - mounting element must be dirt-free.

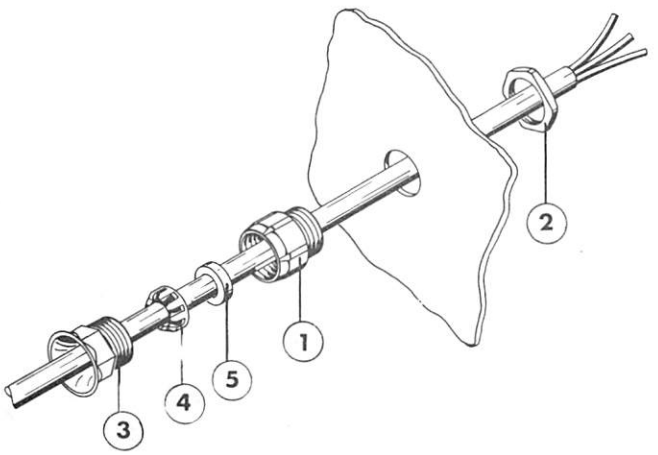
The half-cylindrical centering surface milled into the longitudinal spindle nut serves for centering the clutch. This centering surface must be dirt- and dust-free when mounting.

ELECTRICAL CONNECTION

1. REMOVE MACHINE PLUG FROM OUTLET.

2. Dismount both covers from the base of the machine.

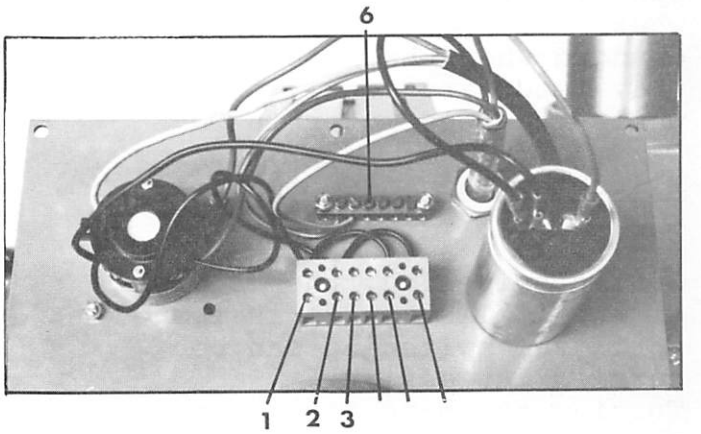
3. Remove plug on left cover, mount basic element (1) of screw-type conduit fitting with lock nut (2).
Remove left cover and rubber padding.
Thread lock nut (3), cone element (4) and rubber ring (5) onto the cable as illustrated.



4. Clamping the cable ends onto the right housing cover:

a) Single-phase model

Clamp the grounding wire (yellow/green) to a free contact point of the grounding strip (6).
The blue and brown wires (Mp, R) are clamped to contact points 1 and 2.



b) Three-phase model

Clamp the grounding wire (yellow/green) to a free contact point of the grounding strip (6).
The blue, brown and black wires (R,S.T) are clamped to contact points 1,2 and 3.

NOTE:

With three-phase execution, it is possible that the motor runs in the wrong direction (feed direction of the milling table does not correspond wit the arrow on the motor switch plate). In this case 2 wires (for example, the blue and brown) must be interchanged.

5. Mount right cover with rubber padding, tighten cable with screw-type conduit fitting on left housing cover.

SWITCHING THE FEEDS

Opposite to the milling head, where the speeds may only be changed when the machine is OFF, feeds are mostly switched while the feed motor is ON.

Switching when feed motor is OFF

During switching, the handwheel of the milling table is turned until the switching can be carried out easily.
Turning the handwheel is necessary, because it often can happen that the teeth of the control shaft are on top of one another.

Switching while feed motor is ON

The motor switch of the feed unit is switched to the left or to the right. The lever of the gear is turned to the required feed size shown on feed plate.

NOTE:

Always switch until lever rests in notch again.

Never switch by force.

CHOICE OF FEED SIZE

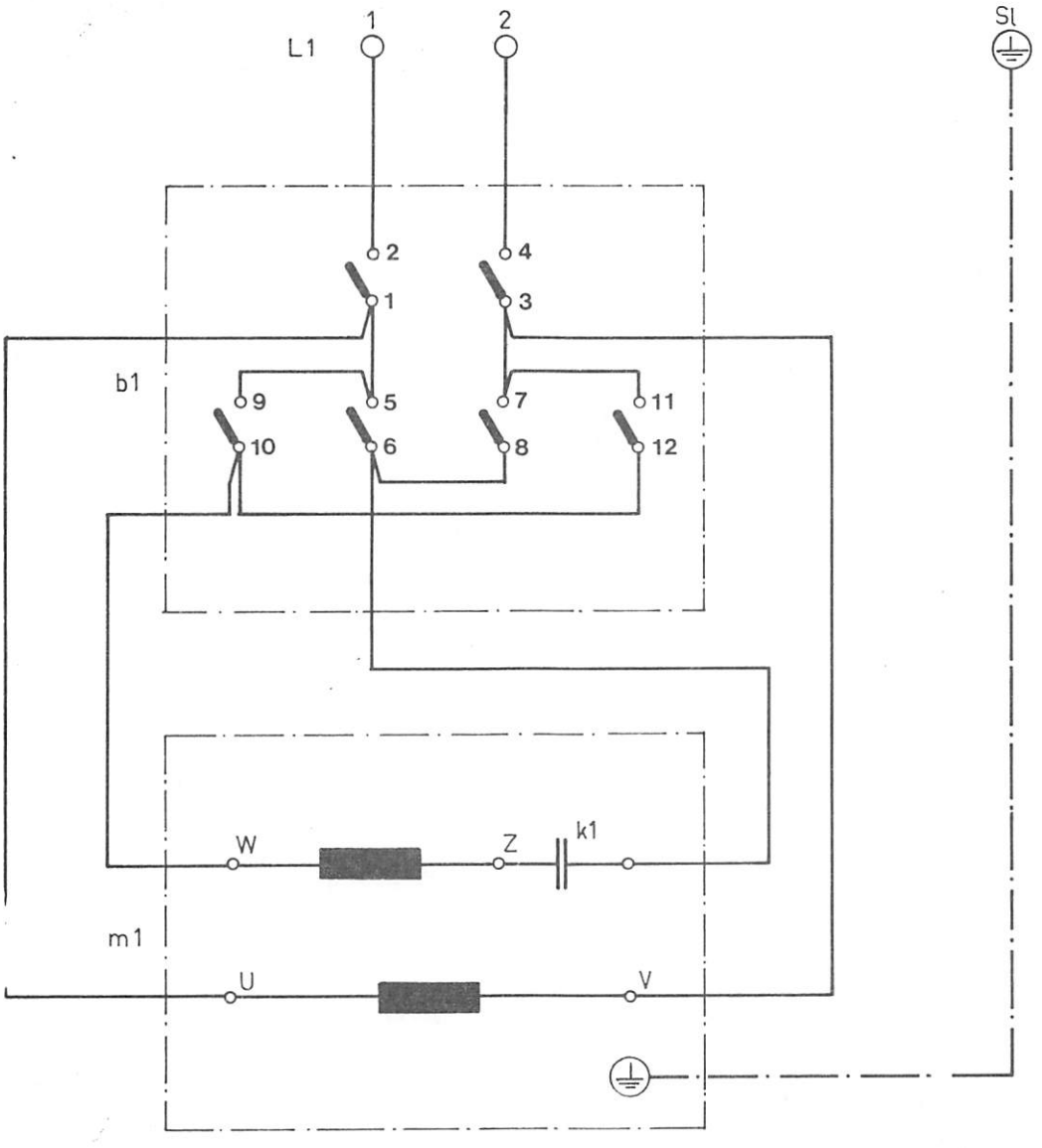
Guidelines

- The harder the workpiece and the larger the chip removal, the smaller the feed speed.
- The smaller the feed speed with the same spindle speed, the smoother the milled surface.
- The larger the feed speed, the more the tool will heat up and the larger the cuting power.
- The smaller the diameter of the milling tool, the smaller the feed speed. If the feed speed is too fast, the feed pressure can break the milling tool.

CIRCUIT DIAGRAM AUTOMATIC FEED UNIT

Single-phase

Clamping strip FB-2



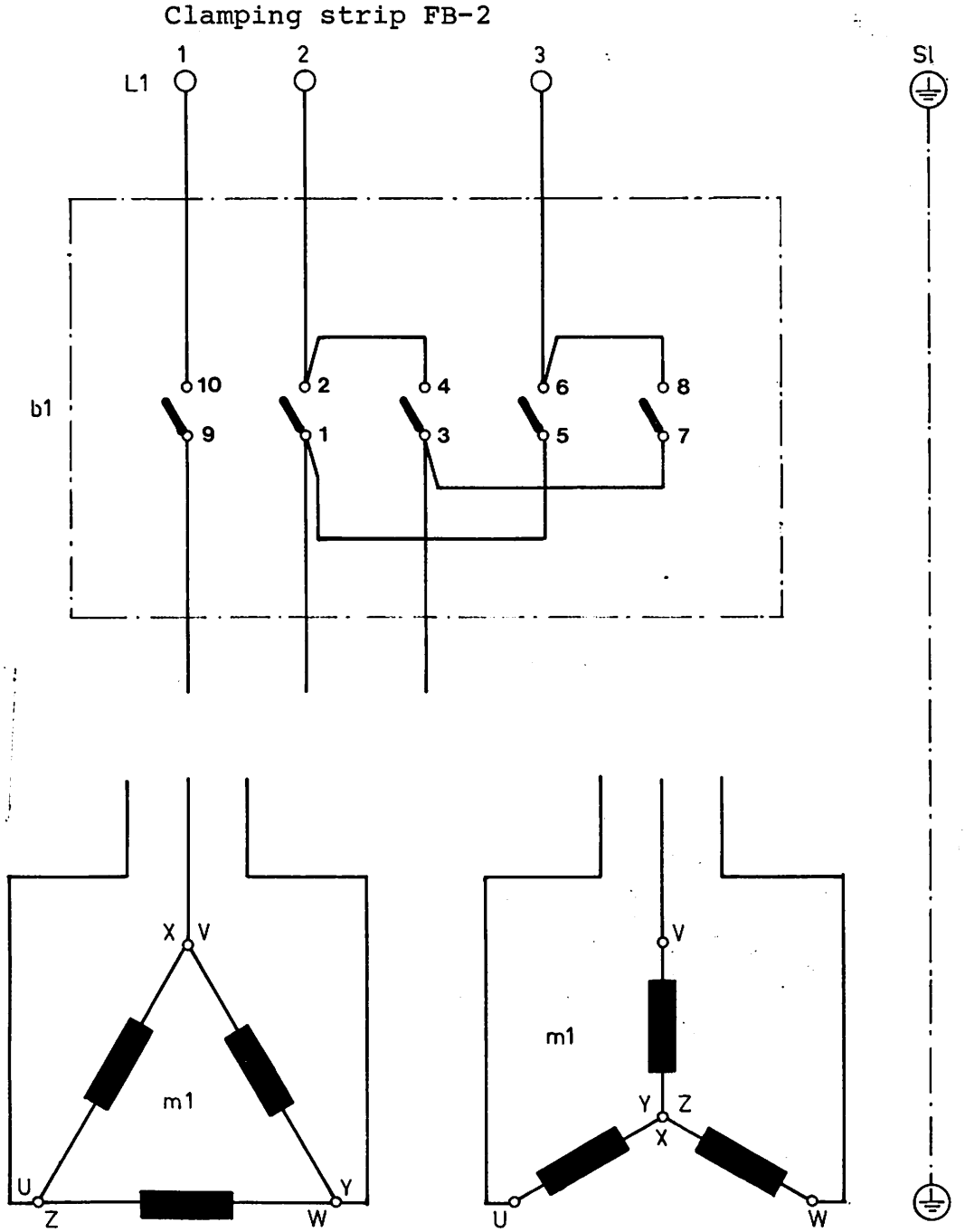
k1 Condenser
b1 Motor switch
m1 Motor

Wiring scheme Motor switch

b1	1 2	3 4	5 6	7 8	9 10	11 12
right	x	x	x	—	—	x
0	—	—	—	—	—	—
left	x	x	—	x	x	—

CIRCUIT DIAGRAM

Three-phase



b1 Motor switch

M1 Motor

Control or see motor rating plate

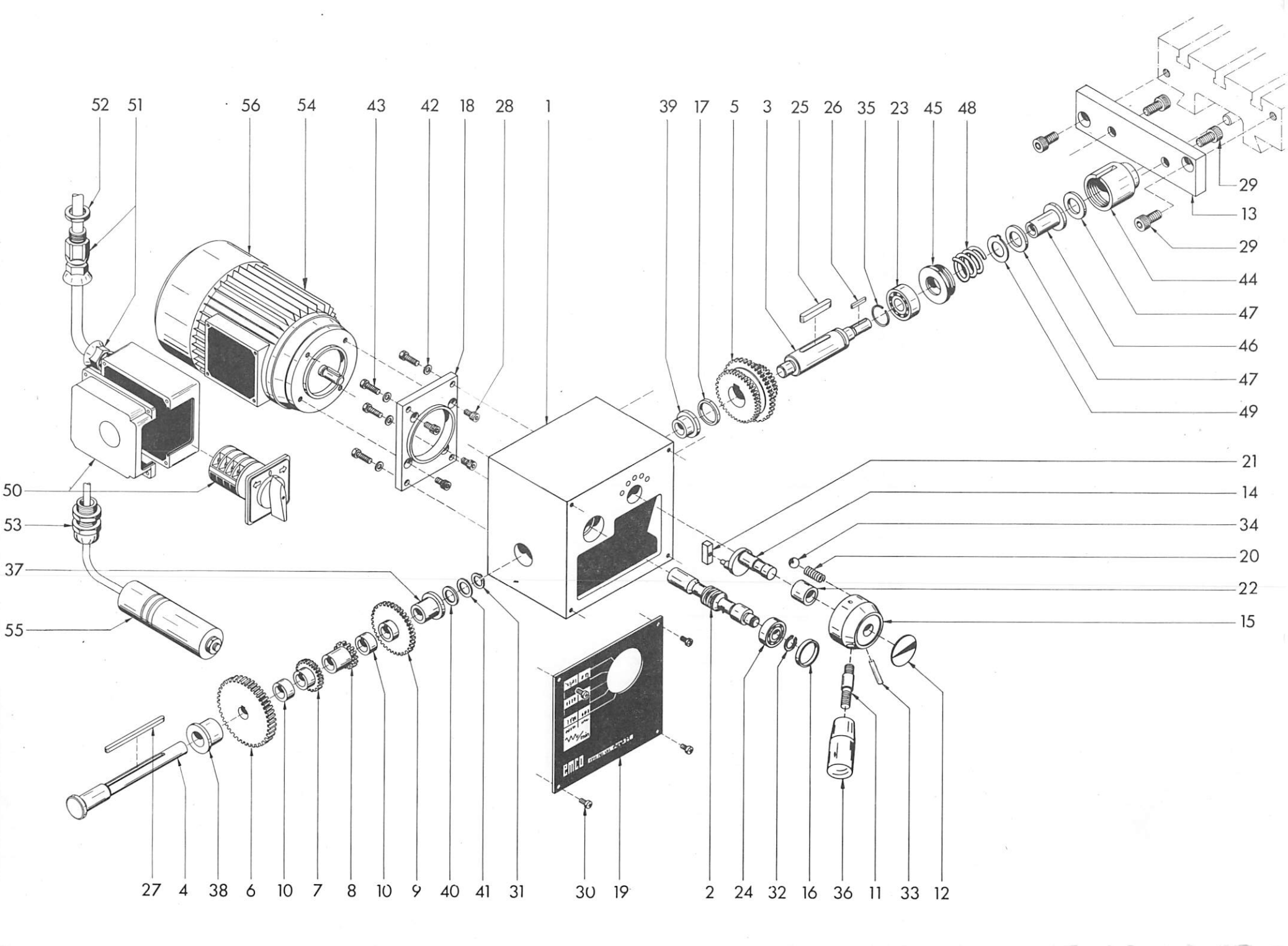
Wiring scheme Motor switch

b1	1 2	3 4	5 6	7 8	9 10
	x	—	—	x	x
0	—	—	—	—	—
left	—	x	x	—	x

SERVICETEILE

SERVICE PARTS

PIECES DE SERVICE


52
51
56
54
43
42
18
28
1
39
17
5
3
25
26
35
23
45
48
29
13
29
44
47
46
47
49
21
14
34
20
22
15
50
53
37
55
27
4
38
6
10
7
8
10
9
40
41
31
30
19
2
24
32
16
36
11
33
12
EMCO

Pos.	Ref. No.	DIN		Benennung	Description	Designation
				Vorschubgetriebe	**Feed mechanism**	**Mecanisme d'avance**
1	F9A 000 010			Vorschubgehäuse	Housing	Boîte d'avance
2	F9A 000 020			Schnecke	Worm	Vis sans fin
3	F9A 000 030			Schaltwelle	Control shaft	Arbre de commande
4	F9A 000 040			Welle	Shaft	Arbre
5	F9A 000 050			Schiebezahnrad	Sliding gear	Train baladeur
6	F9A 000 060			Schneckenrad	Worm gear wheel	Roue à vis sans fin
7	F9A 000 070			Zahnrad 24	Gear 24	Engrenage 24
8	F9A 000 080			Zahnrad 15	Gear 15	Engrenage 15
9	F9A 000 090			Zahnrad 39	Gear 39	Engrenage 39
10	F9A 000 110			Distanzring	Compensating ring	Bague d'écartement
11	F9A 000 120			Stange	Bar	Tige
12	F9A 000 130			Funktionsschild	Indicator plate	Plaquette indicatrice
13	F9A 000 140			Getriebeträger	Mounting element	Lardon de montage
14	F9A 000 150			Schaltbolzen	Operating bolt	Boulon de manoeuvre
15	F9A 000 160			Schaltnabe	Hub	Moyeu
16	F9A 000 170			Distanzscheibe	Washer	Rondelle
17	F9A 000 180			Scheibe	Washer	Rondelle
18	F9A 000 190			Motorflansch	Flange	Bride
19	F9A 000 200			Frontschild	Front plate	Plague frontale
20	D1A 000 390			Druckfeder	Compression spring	Ressort de compression
21	E3A 010 100			Gleitstein	Slider	Crosse
22	E3A 010 090			Lagerbüchse	Bearing bush	Douille de palier
23	ZLG 62 0101	6201 - Z		Rillenkugellager	Ball bearing	Roulement à billes
24	ZLG 60 0001	6000 - Z		Rillenkugellager	Ball bearing	Roulement à billes
25	ZFD 85 6636	A6x6x36 DIN6885		Paßfeder	Key	Clavette
26	ZFD 85 4418	A4x4x18 DIN6885		Paßfeder	Key	Clavette
27	ZFD 85 4480	A4x4x80 DIN6885		Paßfeder	Key	Clavette
28	ZSR 12 0508	M5x8 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
29	ZSR 12 0816	M8x16 DIN912-6.9		Zylinderschraube	Allen head screw	Vis 6 pans creux
30	ZSR 89 0408	M4x8 DIN7985-4.8		Linsenschraube	Filister head screw	Vis à tête lentiforme
31	ZRG 71 1210	12x1 DIN 471		Sicherungsring	Circlip	Anneau de retenue
32	ZRG 71 1010	10x1 DIN 471		Sicherungsring	Circlip	Anneau de retenue
33	ZHL 81 0324	3 x 24 DIN 1481		Spannhülse	Lock pin	Goupille de serrage
34	ZKG 00 1060	6GK3 DIN5401		Stahlkugel	Ball	Bille en acier
35	ZRG 21 0200	INA WR 20		Sprengring	Retaining ring	Bague de retenue
36	ZGF 15 2108	21xM8 GN 513		Zylinderknopf	Knob	Bouton cylindrique
37	ZBU 50 1003	L12G7x18r6x20 DIN 1850		Büchse	Bush	Douille
38	ZBU 50 1002	L16G7x22r6x20 DIN 1850		Büchse	Bush	Douille
39	ZBU 50 1004	L12G7x18r6x12 DIN 1850		Büchse	Bush	Douille
40	ZSB 10 2181	12x18x1,2 DIN988		Stützscheibe	Washer	Rondelle
41	ZSB 12 1201	12x18x0,1 DIN988		Paßscheibe	Compensating washer	Rondelle de compensation
	ZSB 12 1203	12x18x0,3 DIN988		Paßscheibe	Compensating washer	Rondelle de compensation
	ZSB 12 1205	12x18x0,5 DIN988		Paßscheibe	Compensating washer	Rondelle de compensation
42	ZSB 25 0530	B5,3 DIN 125		Scheibe	Washer	Rondelle
43	ZSR 33 0516	M5x16 DIN933-5.6		Sechskantschraube	Hexagon head screw	Vis hexagonale
	F9A 010 000			Gruppe Kupplung	Coupling compl.	Ens. embrayage
44	F9A 010 010			Gehäuse	Housing	Corps
45	F9A 010 020			Gewindering	Threaded ring	Bague filetée
46	F9A 011 000			Zentrierstück	Centering piece	Pièce de centrage
47	C4A 180 020			Kupplungsscheibe	Coupling washer	Rondelle d'embrayage

Pos.	Ref. No.	DIN		Benennung	Description	Designation
48	C4A 180 030			Druckfeder	Compression spring	Ressort de compression
49	C4A 180 040			Scheibe	Washer	Rondelle
				Gruppe E-Ausrüstung	**Electrical equipment compl.**	**Ens. équipement electrique**
50	ZEL 21 0012			Schalter Wechselstrom	Switch single phase	Interrupteur monophasé
	ZEL 21 0013			Schalter Drehstrom	Switch threephase	Interrupteur triphasé
51	ZPG 10 0008	MZB 13		Kabelverschraubung	Screw-type conduit fitting	Raccordement à vis
52	ZPG 20 1350	PG 13,5		Gegenmutter	Lock nut	Contre-ecrou
53	ZPG 10 0009	STP 11		Kabelverschraubung	Screw-type conduit fitting	Raccordement à vis
54	ZMO .. .... *			Motor	Motor	Moteur
55	ZKO .. .... *			Kondensator	Condenser	Condensateur
56	ZME 20 0020			Lüfterhaube für Motor	End shield	Capot de ventilateur

Wechselstromausführung
Single phase equipment
Equipement monophase

Spannung Voltage (V) Tension	Frequenz Frequenzy Frequence	Ref. Nr. für Kondensator Ref. Nr. for condenser Ref. Nr. condensateur	Ref. Nr. für Motor Ref. Nr. for motor Ref. Nr. moteur
100	50	ZKO 18 4512	ZMO 58 1100
110	50	ZKO 18 4512	ZMO 58 1110
220	50	ZKO 18 4003	ZMO 58 1220
230	50	ZKO 18 4003	ZMO 58 1230
240	50	ZKO 18 4003	ZMO 58 1240
250	50	ZKO 18 4003	ZMO 58 1250
100	60	ZKO 18 4512	ZMO 59 1100
115	60	ZKO 18 4512	ZMO 59 1115
220	60	ZKO 18 4003	ZMO 59 1220

Drehstromausführung
Three phase equipment
Equipement triphase

Spannung Voltage (V) Tension	Frequenz Frequency Frequence	Ref. Nr. für Motor Ref. Nr. for motor Ref. Nr. moteur
220	50	ZMO 58 3220
380	50	ZMO 58 3380
440	50	ZMO 58 3440
350	50	ZMO 58 3350
500	50	ZMO 58 3500
220	60	ZMO 59 3220
440	60	ZMO 59 3440